16—1916

Driveway, Brandon Experimental Farm.

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS FROM THE

DIRECTOR
DIVISION OF CHEMISTRY
DIVISION OF FIELD HUSBANDRY
DIVISION OF ANIMAL HUSBANDRY

FOR THE YEAR ENDING MARCH 31, 1915.

PRINTED BY ORDER OF PARLIAMENT.

OTTAWA
PRINTED BY J. DE L. TACHÉ, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1915

[No. 16—1916]

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, March 31, 1915.

SIR,—I have the honour to submit, for your approval, the twenty-eighth annual report of the work carried on at the several Dominion Experimental Farms and Stations.

It was found necessary last year, for the first time, to bring out this report in two volumes, owing to the larger number of farms reported on and the greater amount of experimental work carried on at each.

The division of the whole into Sections A and B has been maintained, the experience of another year having accentuated the approval with which this arrangement was first received.

Section A contains my report as Director, and a summary of the year's results in the various Divisions on the Central Experimental Farm and on the branch Experimental Farms, Stations, and Substations. For the preparation of these divisional and branch farm notes, I am indebted to the chief officers of the divisions here and to the superintendents of the branches.

Section B contains detailed reports on the various lines of experimental work under way throughout the Dominion Experimental Farms system during the year These have been prepared by the Dominion officers having supervision of such work on the Central and branch farms, in collaboration with the superintendents of the latter.

These detailed reports fall under the heads of Animal Husbandry, Bee-keeping, Botany, Cereal Breeding and Variety Testing, Chemistry, Field Husbandry, Forage Crops, Horticulture (including Vegetable Gardening and Flowers), Poultry Husbandry, and Tobacco Husbandry.

Section A, which provides a concise, yet comprehensive, account of the work, is designed especially for those desirous of obtaining general information as to what is being done on the Experimental Farms system.

Section B is intended more immediately to aid the farmer in the various details of his work.

I have the honour to be, sir,

Your obedient servant,

J. H. GRISDALE,

Director, Dominion Experimental Farms.

To the Honourable

The Minister of Agriculture,

Ottawa.

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SECTION B.

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ANNUAL REPORT OF THE EXPERIMENTAL FARMS

FOR THE YEAR ENDING MARCH 3 , 1915.

REPORT OF THE DIRECTOR

J. H. GRISDALE, B.Agr.

FIELD CROP AND LIVE STOCK NOTES FOR 1914.

The area under field crops in the Dominion in 1914 is estimated to have been 35,102,175 acres, as compared with 35,375,430 acres in 1913, a decrease of 273,255 acres. Drought is estimated to have caused a crop failure in 1914 over 1,665,500 acres, so that the total decrease in productive area, in 1914, was some 1,938,755 acres.

On the other hand, the total value of the field crops produced in the two years 1913 and 1914, is estimated at $552,771,500 for the former and $638,580,300 for the latter, an increase of $85,808,800. This increase is chiefly to be attributed to higher prices since the outbreak of the war. A comparison of the figures in the following tables will show this marked rise in price quite clearly.

While the quality of the grain in 1914 was not equal to that of 1913, it may be classed as fair.

A comparison of the numbers of farm live stock for the years 1910-14, inclusive, as given in table III, will show that there has been no marked increase in any class in 1914, and in some cases a decrease is recorded.

Table I.—Comparison of Yields and Prices Obtained for the Years 1913 and 1914.

Crop.	Average Yield per acre.		Average Price per bush.		Total Production.	
	1913	1914	1913	1914	1913	1914
	bush.	bush.	$	$	bush.	bush.
Fall wheat	23·29	21·41	·80	1·05	22,592,000	20,837,000
Spring wheat	20·81	15·07	·66	1·24	209,125,000	140,443,000
All wheat	21·04	15·67	·67	1·22	231,717,000	161,280,000
Oats	38·78	31·12	·32	·48	404,669,000	313,078,000
Barley	29·96	24·21	·42	·60	48,319,000	36,201,000
Rye	19·28	18·12	·66	·83	2,300,000	2,016,800
Peas	18·05	17·64	1·11	1·46	3,951,800	3,362,500
Beans	17·19	18·20	1·88	2·31	800,900	797,500
Buckwheat	21·99	24·34	·64	·72	8,372,000	8,626,000
Mixed grain	33·33	35·36	·55	·66	15,792,000	16,382,500
Flax	11·30	6·62	·97	1·03	17,539,000	7,175,200
Corn for husking	60·30	54·39	·64	·71	16,772,600	13,924,000
Potatoes	165·88	180·02	·49	·49	78,544,000	85,672,000
Turnips, etc	358·30	394·30	·28	·27	66,788·000	69,003,000
	tons.	tons.	per ton.	per ton.	tons.	tons.
Hay and clover	1·33	1·28	11·48	14·23	10,859,000	10,259,000
Fodder corn	8·62	10·25	4·78	4·91	2,616,300	3,251,800
Sugar beets	8·71	8·98	6·12	5·99	148,000	108,600
Alfalfa	2·54	2·42	11·85	14·17	237,770	218,830

TABLE II.—Comparison of Eastern Canada, Prairie Provinces, and British Columbia as to Yields and Prices Obtained.

Crop.	Eastern Provinces.				Prairie Provinces.				British Columbia.			
	Aver. Yield per acre.		Aver. Price obtained.		Aver. Yield per acre.		Aver. Price obtained.		Aver. Yield per acre.		Aver. Price obtained.	
	1913	1914	1913	1914	1913	1914	1913	1914	1913	1914	1913	1914
	bush.	bush	$	$	bush.	bush.	$	$	bush.	bush.	$	$
Fall wheat	23·91	21·51	·85	1·08	21·00	21·11	·62	·94	33·14	31·82	1·01	1·22
Spring wheat	19·39	19·70	1·10	1·16	19·35	14·94	·64	1·25	26·67	27·77	·99	1·23
Oats	35·00	43·57	·52	·52	43·07	28·16	·25	·44	55·50	55·93	·58	·62
Barley	29·32	29·7	·67	·69	30·30	20·87	·32	·52	35·25	37·29	·68	·92
Peas	18·00	16·21	1·16	1·46	17·22	17·23	·84	1·47	26·67	30·00	1·50	1·45
Rye	18·16	17·21	·72	·87	23·62	2·12	·48	·76	......	......	......	
Flax	22·18	15·37	1·42	1·72	11·24	6·57	·98	1·02	......	......	......	
Potatoes	162·00	191·00	·49	·42	170·00	13·01	·40	·82	207·30	182·00	·66	·78
Turnips, etc	287·48	377·29	·24	·28	252·22	25·39	·48	·65	584·35	431·00	·60	·53
	tons.	tons.			tons.	tons.			tons.	tons.		
Hay and clover	1·30	1·25	11·51	14·57	1·59	1·53	8·44	8·28	2·11	2·23	17·00	15·54
Sugar beets	9·23	9·00	5·20	6·00	5·00	6·00	5·00	5·00	......	......	......	
Fodder corn	8·65	10·53	4·66	4·84	3·69	2·32	8·47	7·16	7·66	8·00	12·00	6·00
Alfalfa	2·31	2·25	11·90	14·97	2·51	2·59	9·54	12·15	4·60	3·33	14·66	13·60

TABLE III.—Farm Live Stock, 1910-14.

——	1910	1911	1912	1913	1914
Eastern Provinces—					
Horses	1,341,065	1,343,570	1,335,628	1,436,207	1,441,381
Milch cows	2,426,280	2,076,056	2,079,188	2,188,824	2,097,586
Other cattle	2,577,867	2,509,622	2,410,671	2,479,406	1,904,976
Sheep	2,253,777	1,850,900	1,750,994	1,747,108	1,630,714
Swine	2,342,304	2,864,603	2,638,410	2,491,564	2,357,128
Western Provinces—					
Horses	872,134	1,194,927	1,296,994	1,369,283	1,445,652
Milch cows	417,671	484,170	491,289	516,011	539,998
Other cattle	1,673,096	1,324,405	1,315,681	1,336,098	1,359,464
Sheep	344,693	285,130	290,685	336,423	382,331
Swine	411,660	712,221	806,415	922,221	1,038,102
British Columbia—					
Horses	....	57,415	59,735	60,518	60,705
Milch cows	....	33,953	34,011	35,599	35,702
Other cattle	....	105,230	101,021	100,183	99,091
Sheep	....	39,272	40,702	45,000	45,000
Swine	....	33,604	32,485	34,541	39,031

NOTE.—Figures for 1910 from British Columbia not available.

METEOROLOGICAL RECORDS AT OTTAWA.

Table of Meteorological Observations taken at the Central Experimental Farm, Ottawa, from April 1, 1914, to March 31, 1915, giving maximum and mean temperature for each month, with date of occurrence; also the rainfall, snowfall, and total precipitation.

Months.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°		In.	In.	In.		In.	
April..........	48·01	29·48	18·52	38·74	70·0	19th....	13·0	13th....	2·04	4·00	2·47	19	0·77	26th.
May..........	73·65	45·35	28·30	59·50	92·8	27th....	31·0	1st......	0·30	......	0·30	7	0·16	30th.
June..........	75·23	51·04	24·18	63·13	91·0	24th....	38·0	20th....	2·21	......	2·21	9	0·65	24th.
July..........	80·70	56·81	23·89	68·75	92·0	17th....	44·2	22nd....	1·41	......	1·41	12	0·54	23rd.
August........	77·50	53·61	23·89	65·55	90·0	10th....	41·0	26th....	2·38	......	2·38	11	0·60	2nd.
September....	69·81	46·42	23·38	58·11	92·0	22nd....	30·0	29th....	2·09	......	2·09	11	0·61	2nd.
October.......	58·30	40·06	18·23	49·17	77·0	4th....	22·0	27th....	1·85	s	1·85	12	0·46	10th.
November....	37·52	23·07	14·45	30·29	64·6	1st.....	— 2·2	18th....	1·70	17·75	3·50	13	1·18	16th.
December.....	24·76	9·00	15·76	16·88	45·6	3rd....	—25·0	26th....	0·66	18·00	2·46	12	0·80	14th.
January.......	22·76	6·80	15·96	14·78	40·0	7th....	—25·4	30th....	0·97	21·50	3·12	14	0·70	25th.
February......	26·95	11·78	15·17	19·36	40·0	15th....	—10·5	4th....	0·69	15·25	2·21	13	0·40	3rd.
March.........	34·40	17·79	16·60	25·99	45·6	24th....	3·0	3rd....	0·47	2·00	0·67	9	0·23	21st.
	.....	.....	.....	.....	....	....	....	....	16·77	78·50	24·67	142	....	

Rain or snow fell on 142 days during the twelve months.
Heaviest rainfall in 24 hours, 1·18 inches on November 16.
Heaviest snowfall in 24 hours, 8·00 inches on December 14.
Highest temperature during the twelve months was 92·8° on May 27.
The lowest temperature during the twelve months was —25·4° on January 30.
During the growing season rain fell on nineteen days in April, seven days in May, nine days in June, twelve days in July, eleven days in August, and eleven days in September.
May shows the lowest numbers of days with precipitation, viz., seven.
Total precipitation during the twelve months, 24·67 inches, as compared with 28·51 inches during 1913-14.

Rainfall, Snowfall, and Total Precipitation from 1890 to 1914; also, the average annual amount that has fallen.

Years.	Rainfall.	Snowfall.	Total Precipitation.
	Inches.	Inches.	Inches.
1890	24·73	64·85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71·50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	35·97
1899	33·86	77·25	41·63
1900	29·48	108·00	40·72
1901	29·21	97·25	38·91
1902	25·94	101·75	36·10
1903	26·43	85·00	34·92
1904	25 95	108·75	36·79
1905	23·71	87·25	32·42
1906, January 1 to March 31	1·90	24·50	4·34
1906–07	21·73	72·50	28·94
1907–08	24·70	134·75	38·18
1908–09	22·13	107·90	32·91
1909–10	28·40	61·25	34·51
1910–11	18·94	88·25	27·72
1911–12	20·12	98·50	29·95
1912–13	32·54	106·50	43·18
1913–14	21·51	70·25	28·51
1914–15	16·77	78·50	24·67
Total for 25 years and 3 months	634·33	2,284·00	862·99
Average for 25 years	25·37	91·36	34·51

Record of Sunshine at the Central Experimental Farm, Ottawa, from April 1, 1914, to March 31, 1915.

Months.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April	24	6	181·0	6·03
May	31	0	275·1	8·87
June	26	4	270·2	9·00
July	30	1	295·7	9·53
August	29	2	233·7	7·53
September	28	2	224·8	7·49
October	22	9	143·5	4·62
November	19	11	76·6	2·55
December	18	13	91·5	2·95
January	23	8	87·1	2·80
February	19	9	100·3	3·54
March	30	1	211·5	6·82

WILLIAM T. ELLIS,

Observer.

PUBLICITY.

Since the inauguration of the Dominion Experimental Farms in 1886, with a Central Farm as headquarters at Ottawa and four branch Farms—one in each of the provinces of Nova Scotia, Manitoba, Northwest Territories, and British Columbia—the Farms system has expanded until to-day there are twenty-nine Experimental Farms, Stations, and Substations established throughout the Dominion, where systematic experimental and research work is being conducted by specially trained investigators seeking to solve the innumerable problems which underlie successful farm operations. These Farms and Stations are equipped and maintained for the special benefit of the farmers of Canada, and our aim is to place before these farmers in a practical and understandable manner the results of our experiments and investigations.

In no small measure we have assisted in the extraordinary development which has taken place in Canadian agriculture during the past quarter of a century; but, helpful as we have been, we realize that the objects for which the Dominion Experimental Farms were incepted will not have been fully attained until every one of the 765,000 farmers of this country has a knowledge of our institutions, of the work we are doing, and is directly or indirectly benefiting by our experience.

By short courses, lectures, correspondence, reports and bulletins, and through the agricultural press we are imparting a vast amount of valuable information; but, from lack of the necessary facilities and machinery, that information is not as widely disseminated as we should wish; nor are we able to get in touch with a very large number of the men who more particularly need our assistance. There are many thousands of farmers throughout the Dominion, especially in the more recently settled sections, who are not receiving directly or regularly our publications; who do not know of the existence of the Farms System, and that these bureaus of agricultural information are available to them for advice and suggestions when confronted with problems which they themselves are unable to solve.

For these reasons, the question of greater publicity concerning the Experimental Farms has been receiving our earnest consideration for some time past, with the result that early in the spring of 1914 provision was made for taking definite action in the matter. Of the several schemes contemplated it appeared to us that, with the facilities available, an organized plan of attending the principal exhibitions and fairs throughout the Dominion would, for the first year at all events, be the most economical and fruitful of results, since we could by a representative and practical exhibit: (1) impart considerable information to the many thousands of visitors to the fairs; (2) we could make known the fact that there was an extensive system of Dominion Experimental Farms with stations in every province of the Dominion; and (3) attention could be directed to our mailing list and to the large number of publications available for distribution on application.

EXHIBITIONS ATTENDED.

Under my supervision, Mr. J. F. Watson, of the Experimental Farms staff, was given charge of the work of bringing together representative exhibits from the various Divisions of the Central Farm, and the carrying out of the programme of attending the principal exhibitions and fairs to be held during 1914 throughout the Dominion.

The plan of organization adopted provided for assembling at the Central Farm the staging and exhibits for five circuits of fairs, each circuit being arranged so as to permit of attending as many fairs as possible. In accordance with this plan a "Dominion Experimental Farms' Exhibit," including an exhibit from the branch Farm nearest to the place of exhibition, and an exhibit from each of the Divisions of the Central Farm, representing Animal Husbandry, Field Husbandry, Cereals, Chemistry, Horticulture, Botany, Poultry, Bees, Forage Crops, and Tobacco, was shown at the following exhibitions: Shubenacadic, N.S.; Sydney, N.S.; St. John, N.B.;

Charlottetown, P.E.I.; Quebec, Que.; Three Rivers, Que.; Sherbrooke, Que.; London, Ont.; Ottawa, Ont.; Winnipeg, Man.; Brandon, Man; Regina, Sask.; Prince Albert, Sask.; Saskatoon, Sask.; Calgary, Alta.; Lethbridge, Alta.; Medicine Hat, Alta.; Vancouver, B.C.

With the co-operation of the superintendents of the branch Farms and Stations who, with their assistants, attended the exhibitions in their respective localities, we were able in an attractive and practical manner to place before some hundreds of thousands of visitors to the fairs some of the results of our work; while our superintendents and their assistants furnished information regarding the exhibits tabled, and by discussions and answering questions gave much useful advice concerning all lines of farm activity. As a direct result over four thousand applications were received from persons desirous of having their names placed on our mailing list.

At the close of the exhibition season we received many very satisfactory and complimentary reports from exhibition managers and visitors to the fairs and from our own superintendents and from special inquiries which we made regarding the usefulness of our exhibits. Those reports clearly indicated that, as was expected, attendance at exhibitions is one of the very best means towards the end of greater publicity concerning our institutions and of translating the results we are obtaining in the field and in the laboratory. We hope to continue this line of educational work on a more extended scale next year, and to endeavour especially to make the Dominion Experimental Farms exhibit one of the main features at a large number of the smaller fairs throughout the Dominion, as by including the smaller fairs many thousands of the farming community who do not visit the larger and principal exhibitions would be given an opportunity of making use of the institutions equipped and operated for their express benefit.

ILLUSTRATION STATIONS.

In October, 1914, accompanied by Mr. Angus Mackay, of Indian Head, Sask., for part of the time, and later by Mr. W. H. Fairfield, Lethbridge, Alta., I visited many points in that tract of country extending from Herbert, Sask., on the east to Pincher Creek, Alta., on the west, and from the international boundary on the south to Empress, Alta., on the north. This examination by rail, automobile, and horse was made with a view to the establishment of Illustration Stations at various points in the area mentioned, which, it will be observed, includes those districts more seriously affected by drought that year.

It was decided, after this trip, to carry on illustration work at the following points: Herbert, Cabri, Prelate, Gull Lake, Pambrun, Shaunavon, and Assiniboia in Saskatchewan, and Whitla, Medicine Hat, Carmangay, McLeod, Manyberries, Bow Island, Empress, Carlstadt, and Irvine in Alberta. Farms were selected at practically all these places, and subsequently a scheme of illustration work was prepared and submitted to the owners or operators of the land selected, with proposals as to the conditions under which the Experimental Farms branch was ready to carry on illustration work on their farms, or at least on certain definitely described parts the eof.

The object or purpose of this Illustration Station work probably cannot be better explained than by quoting from a memorandum prepared by myself three years or more ago and then only after the matter had been under consideration for several years. The memorandum referred to bears date January, 1912, and in part reads as follows:—

> "For twenty-five years the Dominion Experimental Farms have been investigating problems in soil cultivation and crop production, and making varietal tests of forage crops and cereals. In that time a great deal of information of value to the farming community in connection with rotations, methods of crop cultivation, the relative values of crops to the average farmer, and the importance of performing different cultural operations at the right time has

been gained. The dissemination of this information amongst our farmers has always been a difficult problem. Many thousands of reports and bulletins are sent out every year, and farmers have been invited to correspond with us and attend agricultural meetings. Still, much remains to be done—in fact, comparatively little has been done so far as reaching the average farmer is concerned, since the average farmer, to a certain extent, and the poor farmer very positively, does not take any interest in publications, and seldom attends agricultural meetings, and so remains in ignorance of the progress that is being made in agricultural science and investigation.

"These conditions have been attracting my attention for some years, and I have been devoting attention to the matter of evolving a plan whereby our poor farmers as well as our good farmers would have an opportunity, and in a certain measure even be compelled to take advantage of or at least to observe the benefits resulting from the introduction of more advanced methods of rotation, cultivation, and crop production generally. With this end in view, I have, during the last year or two, been considering the advisability of proposing and advocating the establishment of a number of Demonstration Farms at certain points in the different provinces of the Dominion, and I now have to propose the following scheme.

"In my opinion, it would be advisable to secure the co-operation of certain farmers at or near the points named below to carry on certain work in crop rotation, soil cultivation, and soil improvement along lines to be laid down by some officer under our direction. At each of these points, I would suggest securing the co-operation of a farmer whose land should be located on some leading or well travelled road within easy walking distance of a central town or village. The farmer chosen should be one of good repute in the neighbourhood, being already recognized as a good farmer, although not necessarily the possessor of a good farm. We would ask this farmer to hand over to us, or at least to handle according to our instructions, from 15 to 30 acres of his land; that is, as many 5-acre fields as there would be years in the rotation we thought it advisable to introduce or follow in the district where the farm was situated."

As indicated above, it is planned by these Illustration Stations to arouse interest in two ways: First by giving ocular demonstrations that (1) the use of good seed, (2) following a suitable rotation, and (3) practising good cultivation, pay; and, second, by working up a feeling of friendly rivalry. By these means it is hoped that many farmers of the locality may be induced to go and do likewise.

The rapid increase in the number of our Experimental Farms and Stations during 1912 and 1913, however, and the many new lines of experiment being got under way on each, presented such an array of administrative and technical problems, and called for such heavy outlay that it was thought unwise to take up the Illustration Station work until our several new Experimental Stations were in fair running order.

It was finally decided to amplify the work suggested in the above memorandum to the extent of including illustration work with a few of the best varieties of grain and some grasses, clovers, alfalfas, corn, and roots, as well as in crop rotation and cultural methods as first intended. It will be observed, too, that the original memorandum spoke of these Illustration Stations as "Demonstration Farms." When it was finally possible to begin the work it was found that certain Provincial Governments had already made a start along somewhat similar lines and were calling the land whereon they were doing their work "Demonstration Farms," hence, to avoid confusion, it was thought advisable to designate the areas under the Dominion Experimental Farms as "Dominion Illustration Stations," and as such are they now known.

An officer well fitted to have supervision of these Stations was selected, viz., Mr. John Fixter, farm foreman on the Central Experimental Farm, Ottawa, for some twenty years, subsequently farm manager at Macdonald College, Que., and latterly chief inspector for the Commission of Conservation. Mr. Fixter's long and practical experience in crop production fits him peculiarly well for this work of supervision, and it is felt that, under his immediate control, these Stations cannot fail to be of very material benefit to the farmers in their near neighbourhood, as well as of very great service to Canadian agriculture in a general way by increasing the common fund of knowledge along the lines mentioned.

Mr. Fixter re-entered our service early in March, and proceeded immediately to the getting of things under way at the points above named and at certain other points enumerated below.

Since in the area above mentioned the great problem has usually been moisture conservation, much attention is being paid to illustration of methods of overcoming this difficulty, and the following diagram indicates the work now under way at the points below mentioned and under the charge of the farmers named therewith.

CROPPING System on Illustration Area.

Fields (5 acres each).	Year.		
	1915.	1916.	1917.
A	Wheat continuously		
B	2 yr. rotation		
	Wheat	Fallow	
C	Fallow	Wheat	
D	3 yr. rotation		
	Fallow	Wheat	Oats.
E	Wheat	Oats	Fallow.
F	Oats	Fallow	Wheat.
G	Alfalfa 2 acres in rows 36 inches apart.		
	" 1 " broadcast.		
	Western rye grass.		
	Corn 2½ acres in rows 36 inches apart.		
H	Wheat 2½ acres.		

LIST of Illustration Stations and Names of Operators.

Assiniboia, Sask	Warren, Percy J. H.
Beadle, Sask	How, J.
Bow Island, Alta	Mortensen, Martin.
Cabri, Sask	Abraham, F. W.
Carmangay, Alta	Nielson, Jos. A.
Empress, Alta	Barry, Frank.
Foremost, Alta	Frankish, T. H.
Grassy Lake, Alta	Perry, D. C. and F. N.
Gull Lake, Sask	Thomas, E. H.
Herbert, Sask	Holmes, Milton.
Jenner, Alta	Fisher, Jerry.
Macleod, Alta	Grier, R. and N.
Magrath, Alta	Meldrum, J. A.
Manyberries, Alta	Sikelson, Matti.
Maple Creek, Sask	Hammond, G. L.
Medicine Hat, Alta	Hunt, E. J.
Milk River, Alta	Kinder, Wm.
Pambrun, Sask	Applgren, Chas. W.
Pincher, Alta	Sandgren and Carlson.
Prelate, Sask	Huxtable, Wm.
Shaunavon, Sask	McLean, Neil.
Whitla, Alta	Babe, R. H.

It is intended to extend this work in the provinces where it has already been started, and similar lines of work are being planned for other provinces.

MEETINGS ATTENDED.

The many duties demanding my attention at Ottawa, and the necessarily large amount of time taken up each year in visiting the various branch Farms and Stations, prevent my attending many agricultural conferences or meetings of any kind. I found it possible, however, to take part in meetings or deliver addresses at a number of points during the past year. Among the more important meetings attended and addressed were the following: Waterloo County Farmers' Institute annual meeting at Galt, Ont.; Farmers' meeting (special), St. Jean Port Joli, Que.; Eastern Ontario Dairymen's Association meeting at Peterborough, Ont.; Patriotism and Production meetings at Kingston, Perth, Belleville, and Peterborough in Ontario; Board of Trade meeting, Lethbridge, Alta.; and Field Naturalists' Club of Ottawa at Ottawa, this last address being on the subject "Milk," and illustrated with lantern slides.

JOURNEYS.

As usual, journeys undertaken have been for the most part such as were connected with the inspection of branch Farms and Stations already under way or else for the purpose of looking into conditions with a view to the establishment of new Stations in districts where such work is not yet begun.

In April and May, 1914, I visited the Experimental Farms and Stations in the Maritime Provinces and Quebec, and in May and June inspected those situated west of the Great Lakes, as well as visited the tobacco Stations at Farnham, Que., and Harrow, Ont.

While in the West at this time I again went over the ground upon which it had for some time been a question of the establishment of a Station for the Okanagan valley, in British Columbia, and also visited a number of possible sites for a Station in southern Manitoba.

In October and November I again visited the western Farms and Stations, and on this occasion was authorized to organize an Experimental Station at Summerland on the site just mentioned as having been again inspected in June. This Station, as reported on elsewhere, is now well under way.

On the occasion of this trip to the West I visited a number of points in the south-western part of Saskatchewan and in the southern part of Alberta. Trips were undertaken along the various railroad lines in these districts in both provinces, stops being made at various points, and runs undertaken by horse or automobile out into the country adjoining the railroads or, in some cases, long automobile runs taken across country where no railroads existed. This trip, taken by direction of the Minister of Agriculture, had for its object not only the familiarizing of myself with agricultural conditions in the area mentioned, but was taken in a large measure with a view to the selection of a number of locations for the carrying on of illustration work in this region where there is a somewhat lighter average annual rainfall than in most parts of the prairie country. The results of this trip are discussed elsewhere under the heading "Illustration Stations."

In December I made a trip to Cochrane, Ont., the present northern terminus of the Toronto and Northern Ontario railway, and the principal town on the Transcontinental railway between Quebec and Winnipeg.

From Cochrane I proceeded west along the Transcontinental railway for about 75 miles, seeking a site for the location of an internment camp for alien enemies who were to be put to work clearing land to be used later for Experimental Farm purposes. A most excellent location was found where the railway crosses the Kapuskasing river, and here camps were opened up and operations begun immediately.

To the eastward of Cochrane I travelled about 150 miles, and finally fixed upon Spirit Lake as being probably the site on the line of the Transcontinental in the pro-

vince of Quebec best suited for a similar purpose. It should be stated that these trips were taken after the snow was on the ground, hence it was rather difficult to fix upon locations likely to be entirely suitable.

Another point I would like to put upon record here is this: that the selection of sites in both cases was very largely influenced, if not entirely controlled, by the fact that it was imperative to select land covered with standing timber to permit of the interned men being put to work at once. Thus, while the land at Kapuskasing is undoubtedly as good as any to be found along the line of the Transcontinental, the same cannot be said of the land at Spirit Lake, inasmuch as locations complying with the "well wooded" clause of the conditions governing the selection of a site were scarce, and in fact about the only available site near the railway fulfilling this requirement was the one selected.

The land at Spirit Lake is undoubtedly rather lower and probably more difficult to drain than might be considered desirable, but the soil is of good quality, and will, I am sure, prove fertile. In any case, it is eminently characteristic of the soils of the district.

These two sites are now being cleared and stumped, but it is not expected that much crop will be produced at either place in 1915.

In March I again visited some of the Farms on the prairies, and did some further work in connection with the Illustration Stations.

CORRESPONDENCE.

Below are tabulated the totals of the letters sent out from the various Divisions at the Central Farm and from the branch Farms and Stations. The total given for reports and bulletins mailed from the Central Farm represents only a very small proportion of the publications actually sent out. The mailing lists and most of the special applications are supplied from the Publications Branch, Department of Agriculture, Ottawa.

CENTRAL EXPERIMENTAL FARM.

Divisions.	Letters. Received.	Letters. Sent.
Director	20,471	13,784
Field Husbandry	1,428	1,205
Chemistry	3,605	2,872
Horticulture	7,586	7,979
Cereals	13,301	3,337
Botany	2,978	3,052
Animal Husbandry	4,163	5,822
Agrostology	728	1,134
Poultry	5,465	7,083
Tobacco	3,795	5,640
French correspondent	6,780	2,982
Apiary	843	844
Miscellaneous	13,191	4,315
Total	84,334	60,049

REPORTS, BULLETINS AND CIRCULARS.

Reports and bulletins mailed	7,361
Circulars	20,395

BRANCH FARMS AND STATIONS.

Farm or Station.	Letters. Received.	Letters. Sent.
Charlottetown	1,270	1,297
Fredericton	1,270	1,051
Nappan	2,571	2,671
Kentville	2,994	3,048
Ste. Anne de la Pocatière	1,094	1,074
Cap Rouge	3,383	3,580
Lennoxville	880	888
Brandon	3,888	4,006
Indian Head	14,614	14,558
Rosthern	3,181	2,873
Scott	1,988	2,093
Lethbridge	4,918	4,400
Lacombe	5,215	5,809
Agassiz	4,850	4,627
Invermere	659	433
Sidney	1,183	904
Total	53,958	53,312

The totals for the branch Farms and Stations are exclusive of reports, bulletins, and circulars sent out.

By adding the totals for the Central and branch Farms, the total number of letters received at all points is seen to be 138,292, and of those sent out, 113,361.

DISTRIBUTION OF SAMPLES.

This distribution was carried on as usual, all applications for grain samples being filled at the Central Farm. From Ottawa, 7,491 samples were sent out. The details of this distribution will be found in the report from the Division of Cereals. From the branch Farms and Stations, the following numbers of samples of potatoes were mailed:—

Charlottetown	29
Kentville	132
Fredericton	51
Nappan	294
Brandon	397
Indian Head	2,648
Rosthern	826
Scott	175
Lethbridge	1,025
Lacombe	1,347
Agassiz	485

This is a total from all Farms and Stations of 14,891 samples. Other distributions of material, more limited in scope, or of a special character, were also made, such as that of tobacco seed, some 4,000 samples of which were sent out, of inoculated soil for the growth of alfalfa, chiefly sent out from the western Experimental Farms, as well as a distribution of sweet corn, vegetable and flower seeds to applicants from Quebec, carried on from the Cap Rouge Station, and of tree seeds, etc., from the Prairie Farms.

PUBLICATIONS ISSUED.

The following publications have been issued during the year, or are in the press at its close:—

The Annual Report of the Dominion Experimental Farms for the year 1913-14.

In the Regular Series of bulletins:—

No. 78, Ventilation of Farm Buildings, by J. H. Grisdale and E. S. Archibald. Different systems of ventilation and their installation are taken up in this bulletin, and their relative merits weighed. It is based upon the results obtained from many years of experiments at the Central Farm.

No. 79, The Renovation of the Neglected Orchard, by M. B. Davis, Assistant in Horticulture. This is a very practical publication on this subject.

No. 80, Lime in Agriculture, by Frank T. Shutt, Dominion Chemist. The uses and methods of application of lime and its compounds are dealt with in a clear and practical manner.

Nos. 81, 82, 83, and 84 give a summary of the results of the season's work in cereals, horticulture, field husbandry, and forage plants, respectively.

No. 85, on Hardy Roses, their Culture in Canada, by W. T. Macoun, Dominion Horticulturist, and F. E. Buck, Assistant, is a compilation of the results of many years of experimental work in the growing of hardy roses.

In the Second Series, there were issued:—

No. 19, on The Planting and Care of Shade Trees, by F. E. Buck, Assistant in Horticulture.

No. 20, The Farmer as a Manufacturer, by A. T. Stuart, Assistant Chemist.

No. 21, on Tobacco Seed-beds, by F. Charlan, Tobacco Husbandman.

No. 22, on The Growing of Field Root, Vegetable, and Flower Seeds in Canada, by M. O. Malte and W. T. Macoun.

No. 23, on Medicinal Plants and their Cultivation in Canada, by J. Adams, Assistant Botanist.

Of Circulars, there were issued:—

No. 6, on The Regulations under the Destructive Insect and Pest Act Governing the Importation, Sale, Shipment, and Export of Potatoes, by H. T. Güssow, Dominion Botanist.

No. 7, on Potash in Agriculture, by the Dominion Chemist, Dr. Frank T. Shutt.

No. 8, Manures and Fertilizers, by Dr. Frank T. Shutt, Dominion Chemist.

No. 9, on The Control of Potato Diseases, by H. T. Güssow, Dominion Botanist.

In connection with the extension of our exhibition work referred to at greater length previously in this report, some thirty-eight exhibition circulars were brought out for distribution at the various points where exhibits were made. The following exhibition circulars were issued this year:—

No. 1. Natural Incubation.
No. 2. Artificial Incubation.
No. 3. Varieties of Grain recommended by Dominion Cerealist.
No. 4. Varieties of Grain recommended by Dominion Cerealist.
No. 5. Distribution and Sale of Seed Grain.
No. 6. The Farmers' Poultry House.
No. 7. Profitable Field Root Varieties for Ontario and adjacent Parts of Quebec.
No. 8. Profitable Field Root Varieties for the Maritime Provinces and Eastern Quebec.
No. 9. Crop Rotations for Central and Eastern Canada.
No. 10. Awnless Brome Grass *vs.* Western Rye Grass.
No. 11. Grape Growing.
No. 12. The Farm Flock.
No. 13. Brooding and Rearing of Chicks.
No. 14. Sweet Clover.
No. 15. Top Grafting.
No. 16. Hotbeds and Cold Frames.
No. 17. Protection of Fruit Trees from Mice and Rabbits, and care of Injured Trees.
No. 18. Bee-keeping in Canada.
No. 19. Tobacco Culture in Canada.
No. 20. Clean Milk.
No. 21. Profits from Dairy Cows.

No. 22. Coulommier Cheese.
No. 23. Cream Cheese and Butter.
No. 24. Seed Treatment for Smut Prevention.
No. 25. List of Publications.
No. 26. Chemistry of Agriculture, Part I.
No. 27. Chemistry of Agriculture, Part II.
No. 28. Chemistry of Agriculture, Part III.
No. 29. Duck Raising.
No. 30. Turkey Breeding.
No. 31. Goose Breeding.
No. 32. Nature's Bank.
No. 33. Feeding of Live Stock.
No. 34. The Farm Well.
No. 35. Crop Rotations for Dry Farming.
No. 36. Recommended Varieties of Grain for British Columbia.
No. 37. Recommended Varieties of Grain for Quebec and Ontario.
No. 38. Recommended Varieties of Grain for the Maritime Provinces.

In March, the first issue of a pamphlet entitled "Seasonable Hints" was brought out. As its name implies, the chief aim of this publication is to place in the farmer's hands some suggestions on the work on which he is presently engaged, and give him the benefit of the results along similar lines obtained at the Experimental Farms. It is planned to bring out further issues of the "Hints" during the coming year, at such times as its value will be greatest, and its contents most timely.

ADDITIONS TO AND CHANGES IN THE STAFF.

The European war has removed from the service of the Farms, though only temporarily it is hoped, a number of assistants at the branch and Central Farms, and also one superintendent, Mr. R. E. Everest, of the Station at Scott. Sask. In most cases, men have been appointed temporarily to fill the positions made vacant during the regular appointee's absence. In addition, the following appointments have been made on the branch Farms:—

Lionel Stevenson, B.S.A., Superintendent, Experimental Station, Sidney, B.C.

R. H. Helmer, Superintendent, Experimental Station, Summerland. B.C.

J. A. McClary, Superintendent, Experimental Station, Lennoxville, Que.

G. C. Routt, Manager, Tobacco Station, Harrow, Ont.; vice W. A. Barnet B.S.A., resigned.

W. H. Gibson, B.S.A., Superintendent, Experimental Farm, Indian Head, Sask.; vice T. J. Harrison, B.S.A., resigned.

W. H. Hicks, B.S.A., Assistant to the Superintendent, Brandon, Man.

T. F. Ritchie, B.S.A., Assistant to the Superintendent at Lennoxville, Que.

C. M. Williams, B.S.A., Assistant to the Superintendent at Nappan, N.S.

At the Central Farm:—

Geo Muir, B.S.A., Assistant to the Dominion Animal Husbandman.

G. G. Moe, B.S.A., Assistant to the Dominion Cerealist; vice R. L. Newton. B.S.A., resigned.

John Adams, M.A., Assistant Dominion Botanist.

F. L. Drayton. Assistant in Plant Pathology.

L. A. Brown, B.S.A., Assistant Chemist.

BUILDINGS.

Very little building work was done during the year, either on the Central or branch Farms, with the exception of some small items on the branch Farms, done by day labour. These are noted in the reports from those points.

CONFERENCE OF SUPERINTENDENTS.

In January last a conference lasting four days was held at Ottawa between the superintendents of the branch Farms and Stations and the officers of the Central Farm. A programme covering the subjects to be discussed was drawn up and followed. The conference did much to systematize the work at the various Farms and Stations, and to strengthen the esprit de corps of the whole staff of the Experimental Farms System.

NEW STATIONS

MORDEN, MAN.

In January, an area of some 280 acres was purchased near Morden, in southern Manitoba, and preliminary work thereon was commenced this spring, under the supervision of Mr. Charles Boyle, as foreman-manager.

SUMMERLAND, B.C.

On the Penticton Indian reserve, at Summerland, B.C., 550 acres were taken over for Experimental Station purposes. Of this area, 275 acres are irrigable. The remaining 275 will be worked under "dry-farming" conditions

On November 8, Mr. R. H. Helmer was appointed Superintendent of the Summerland Station.

Up to March 31 of this year, 91 acres have been cleared and ploughed. A large amount of fluming and ditching has been done, and other preparations made for irrigation, and an agreement made with the municipality of Summerland for supplying water for the above purpose from the town water system.

EXPERIMENTS AT FORT VERMILION, PEACE RIVER DISTRICT, ALBERTA.

Seeding commenced on April 30 at the Station, and was general in the district during the first week in May. May and June were favourable to rapid growth although the rainfall was light. Haying commenced July 15, and the first grain (Black Mesdag oats) was cut on the 22nd. Strawberries were ripe by that date, and raspberries by the end of the month. Prelude wheat was cut July 4.

The first killing frost occurred on the night of September 7.

Some fencing was done on the Station, taking in an additional area of 3 acres.

The amount of fall work done in the Peace River district was considerably above the average, owing to the favourable weather.

The winter of 1914-15 has been a very mild one, with ample snowfall, which should provide abundant moisture for germination and early growth.

Nine varieties of wheat tested gave yields of from 63 to 44 bushels per acre; five varieties of oats from 120 to 60 bushels per acre. Four varieties of barley (six-row) gave returns of from 57 to 51 bushels per acre, and two varieties of two-row yielded 62 and 61 bushels per acre, respectively. One variety of peas tested, the Arthur, yielded 45 bushels per acre.

Five sorts of potatoes gave returns of from 441 to 210 bushels per acre. Garden vegetables such as peas, onions, carrots, asparagus, rhubarb, celery, beans, beets, parsnips, turnips, cucumbers, marrows, squash, pumpkins, cauliflower, cabbage, and tomatoes were successfully grown and were of fine quality.

Corn for ensilage, six varieties of which were tried, ran from 20 to 16 tons per acre. Field turnips (four varieties) from 20 to 15 tons; mangels (four varieties) from 36 to 20 tons; and field carrots (four varieties) from 36 to 26 tons per acre.

Timothy gave 1 ton 1,500 pounds per acre. Canary seed grass 2 tons 1,500 pounds, Western Rye grass 2½ tons, and Brome grass 2¾ tons per acre.

A good stand of several varieties of alfalfa was obtained, the yields running from 1 ton 1,050 pounds to 1,800 pounds per acre for the first cutting. The second cutting was left on the ground in each case.

METEOROLOGICAL RECORDS.

The following records of temperatures, precipitation and sunshine were tabulated by Mr. W. T. Ellis, weather observer at the Central Farm. The latter has also prepared tables comparing the Fort Vermilion records with those at Ottawa.

TABLE OF METEOROLOGICAL OBSERVATIONS taken at Fort Vermilion, Peace River District, Alberta, from April 1, 1914, to March 31, 1915, showing maximum, minimum, and mean temperature; the highest and lowest for each month, with date of occurrence; also rainfall, snowfall, and total precipitation.

1914-15.

Months.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°		In.	In.	In.		In.	
April	46·22	16·73	29·49	31·47	61·1	29th	−14·0	2nd	0·08	......	0·08	1	0·08	28th.
May	63·81	32·64	31·17	48·22	82·9	24th	20·9	4th	0·16	......	0·16	4	0·06	17th.
June	72·11	41·70	30·41	56·90	90·0	15th	29·0	10th	0·66	......	0·66	6	0·34	5th.
July	74·03	45·62	28·40	59·82	90·2	1st	35·2	30th	1·74	......	1·74	10	0·48	21st.
August	72·42	43·13	29·28	57·77	84·0	4th	31·2	23rd	1·80	......	1·80	7	0·90	7th.
September	58·16	33·00	25·16	45·58	76·0	3rd	23·1	17th	0·79	......	0·79	6	0·20	4th.
October	47·59	24·56	23·02	36·07	67·9	8th	15·2	11th	0·25	......	0·25	3	0·11	30th.
November	23·51	3·58	19·93	13·54	43·5	20th	−25·0	17th	......	8·00	0·80	5	0·30	11th.
December	−0·43	-25·84	25·40	-13·14	28·0	17th	−43·5	28th	......	0·50	0·05	1	0·05	21st.
January	3·24	-21·83	25·08	−9·29	32·5	18th	−53·0	26th	......	2·50	0·25	4	0·10	12th.
February	15·73	-15·33	31·07	0·20	27·5	23rd	−43·0	18th	......	3·50	0·35	2	0·30	16th.
March	33·21	1·25	31·96	17·23	55·0	22nd	−22·5	1st	......	8·00	0·80	6	0·25	3rd.
									5·48	22·50	7·73	55		

SOME WEATHER OBSERVATIONS taken at Central Experimental Farm, Ottawa, as compared with those taken at Fort Vermilion, Peace River District, Alberta.

—	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
April.	°	°	°	In.	In.		
Ottawa	38·74	70·0	13·0	2·47	0·77	181·0	6·03
Fort Vermilion	31·47	61·1	−14·0	0·08	0·08	255·2	8·50
May.							
Ottawa	59·50	92·8	31·0	0·30	0·16	275·1	8·87
Fort Vermilion	48·22	82·9	20·9	0·16	0·06	392·3	12·65
June.							
Ottawa	63·13	91·0	38·0	2·21	0·65	270·2	9·00
Fort Vermilion	56·90	90·0	29·0	0·66	0·34	287·8	9·59
July.							
Ottawa	68·75	92·0	44·2	1·41	0·54	295·7	9·53
Fort Vermilion	59·82	90·2	35·2	1·74	0·48	335·4	10·81
August.							
Ottawa	65·55	90·0	41·0	2·38	0·60	233·7	7·53
Fort Vermilion	57·77	84·0	31·2	1·80	0·90	297·1	9·58
September.							
Ottawa	58·11	92·0	30·0	2·09	0·61	224·8	7·49
Fort Vermilion	45·58	76·0	23·1	0·79	0·20	163·7	5·45
October.							
Ottawa	49·17	77·0	22·0	1·85	0·46	143·5	4·62
Fort Vermilion	36·07	67·9	15·2	0·25	0·11	128·2	4·13
November.							
Ottawa	30·29	64·6	−2·2	3·50	1·18	76·6	2·55
Fort Vermilion	13·54	43·5	−25·0	0·80	0·30	43·9	1·46
December.							
Ottawa	16·88	45·6	−25·0	2·46	0·80	91·5	2·95
Fort Vermilion	−13·14	28·0	−43·5	0·05	0·05	60·1	1·93
January.							
Ottawa	14·78	40·0	−25·4	3·12	0·70	87·1	2·80
Fort Vermilion	−9·29	32·5	−53·0	0·25	0·10	63·9	2·06

Part of Experimental Farms Exhibit, Central Canada Exhibition, Ottawa, 1914.

SOME WEATHER OBSERVATIONS taken at Central Experimental Farm, Ottawa—*Con.*

—	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
February.	°	° ′	°	In.	In.		
Ottawa	19·36	40·0	−10·5	2·21	0·40	100·3	3·54
Fort Vermilion	0·20	27·5	−43·0	0·35	0·30	114·7	4·09
March.							
Ottawa	25·99	45·6	3·0	0·67	0·23	211·5	6·82
Fort Vermilion	17·23	55·0	−22·5	0·80	0·25	166·7	5·37

RECORD OF SUNSHINE at Fort Vermilion, Peace River District, Alberta, from April 1, 1914, to March 31, 1915.

Months.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April	30	0	255·2	8·50
May	31	0	392·3	12·65
June	28	2	287·8	9·59
July	28	3	335·4	10·81
August	28	3	297·1	9·58
September	23	7	163·7	5·45
October	18	13	128·2	4·13
November	13	17	43·9	1·46
December	18	13	60·1	1·93
January	23	8	63·9	2·06
February	24	4	114·7	4·09
March	25	6	166·7	5·37

WILLIAM T. ELLIS,
Observer.

EXPERIMENTS AT ST. BRUNO AND FORT RESOLUTION, NORTHWEST TERRITORIES.

ST. BRUNO.

The St. Bruno farm is situated some 20 miles west of Fort Smith. The land was first broken in 1911, four missionaries, with a small herd of cattle and a few horses, settling there.

Two fields were laid out and broken. In 1912 and 1913 the land had not yet been sufficiently worked to yield good crops, but in 1914 good returns were obtained.

Oats, barley, and wheat were grown successfully; also such vegetables as carrots, table beets, onions, lettuce, radishes, peas, and potatoes.

The original herd of eighteen head has now increased to fifty, and some 500 pounds of butter were sold during the season of 1914.

FORT RESOLUTION.

The winter of 1913-14 was severe, and the spring late, snow remaining on the ground until the third week in May. Seeding was completed by May 30, and favourable weather made germination rapid.

Growth was hastened by frequent showers during June and July. There was a slight frost on August 18, and stormy weather in September lodged the oats and barley. Harvesting took place from September 15 to 20, just in time to escape severe frost on the 22nd.

Oats (Eighty Day), barley (Manchurian), wheat (Prelude and Marquis) gave good crops. Four varieties of potatoes were grown successfully; also beans, peas cabbage, carrots, table turnips, beets, and lettuce. Many varieties of flowers bloomed freely.

EXPERIMENTS AT GROUARD, LESSER SLAVE LAKE, ALBERTA.

The wet summer and autumn of 1913 prevented fall work on the land, and when the frost was sufficiently out of the soil about April 18, special efforts were required to get the seeding done at the usual time. This was finished during the first days of May, under favourable conditions for quick growth.

Eighty Day oats were ripe on August 1, Abundance on the 14th, and Banner on the 15th. The latter yielded 45 bushels per acre. In wheats, Early Red Fife, ripe August 18, yielded 27 bushels per acre; Prelude was ripe August 20, and Marquis August 26, yielding 29½ bushels per acre. Preston ripened the same day, and gave 28 bushels per acre. Mensury barley was ripe August 10, giving 40 bushels per acre.

In vegetables, cabbage, cauliflower, celery, tomato, squash, garden peas, beets, lettuce, onions, and carrots all did well. Many varieties of flowers bloomed profusely throughout their season.

EXPERIMENTS AT GRANDE PRAIRIE, ALBERTA.

Spring was very backward at this point, and the weather cold and dry, retarding germination, which was further injured by the fact that a large proportion of the grain had been sown on stubble owing to the bad weather of the preceding fall preventing work on the land.

Potatoes and roots were a failure for the first time in five years.

Three varieties of wheat were tested, Marquis, Prelude, and Preston. They were all grown on summer-fallow. Marquis and Preston yielded about 30 bushels per acre, and Prelude 20 bushels.

The crop of timothy ran about 1 ton to the acre. Clover was winter-killed except in small patches.

EXPERIMENTS AT SALMON ARM, B.C.

Experimental work, chiefly along horticultural lines, was continued by Mr. Thos. A. Sharpe, on his farm at Salmon Arm.

There was an unusual amount of frost in the ground during the winter of 1913-14, and the melting snows of the spring did not penetrate the soil to any depth. Spring rains were light and the summer dry, so spring grain and bush fruits were light crops, and grass and clover a practical failure.

Potatoes and roots were below average in yield.

The experimental orchard gave a medium yield.

Tests were also carried on with different varieties and strains of vegetables.

Clover and alfalfa have done well in the Salmon Arm district. They should play a large part in farming operations there which, in Mr. Sharpe's opinion, should be a combination of dairying and fruit-growing.

Meteorological Report for the Year ending March 31, 1915.

—	Highest Temperature.		Lowest Temperature.		Rainfall.	Snowfall.	Sunshine.	
1914.	°	Date.	°	Date.	Inches.	Inches.	H.	M.
April	74	30	27	21	0·89	....	161	54
May	88	31	30	5	0·96	....	269	36
June	90	30	38	6	1·43	....	[illegible]	42
July	96	30	40	23	0·76	....	284	24
August	93	1	38	30	0·32	....	293	36
September	82	2	34	15	1·52	....	122	0
October	68	14	30	4	1·25	....	120	36
November	54	10	18	15	2·16	4½	28	30
December	42	4	5	19	....	12	23	12
1915.								
January	36	2, 7, 9	1	20	....	21½	40	48
February	44	20	14	13	0·20	2½	51	48
March	65	21	20	2	0·96	....	158	54
					10·54	40½	1,752	0

DIVISION OF FIELD HUSBANDRY.

The work of the Field Husbandry Division is being directed along very practical lines. Its scope may be said to include:—

1. Soil management.
2. Crop management.
3. Agricultural engineering.

Besides conducting experimental work along the lines outlined above, this division supplies grain and fodder for the up-keep of the live stock on the Farm.

The lines of work herein reported upon do not by any means cover the field naturally included in the Division for the reason that only a limited acreage of suitable land is available for experimental tests.

WEATHER CONDITIONS AND CROP YIELDS.

Seeding operations were carried on under unfavourable conditions. April was cold, which retarded seeding, while the drought of the months of May and June resulted in the uneven germination of corn and mangels. Hay made slow growth and yielded

below the average. Straw was short, but the oats filled fairly well and harvested a good yield of grain. Turnips made steady progress, while mangels and corn made remarkable autumn growth, and all yielded up to the average for the Farm. Potatoes produced a bumper crop of good quality.

COST OF PRODUCTION OF FIELD CROPS.

The following table summarizes the costs of producing mangels, corn, oats, and hay in 1914:—

Cost of Production of Field Crops, Central Farm, 1914.

Crop.	Area.	Yield Per Acre.		Cost to Produce.		
		Bushels.	Per acre.	Per ton.	Tons.	Per bush.
	Acres.			$ cts.	$ cts.	Cents.
Mangels	4	17	565	37 52	2 21	6·64
Ensilage corn	32	14·5	....	20 85	1 41	....
Oats	40	....	65	14 97	....	19.37
Oat straw	40	1·04	....	....	....	....
Hay	28	2	....	15 75	7 87	....

ROTATION OF CROPS.

The results of experiments with crop rotations indicate the importance of the order in which crops are grown. A good rotation may be said to include hoed, grain, and hay crops which, for best results, should be grown in the order named. The duration and cultural treatment of the rotations, however, may be varied to suit different conditions. The following rotations are now in operation here, any one of which should prove satisfactory for ordinary farm conditions.

Rotation "A" (five years' duration).—Hoed crop, manured. Grain, seeded down with clovers and grass. Clover hay, top dressed with manure in autumn. Timothy hay, field ploughed in August, top worked and ribbed up in October. Grain, seeded down with red clover to be ploughed under the following spring, when the succeeding hoed crop is corn.

Rotation "B" (five years' duration).—Hoed crop, manured. Grain seeded down with clovers and grass, seeds top dressed with manure in autumn. Clover hay, ploughed in autumn. Grain seeded down with clovers and grass. Clover hay.

Rotation "C" (four years' duration).—Hoed crop, manured. Grain, seeded down with clover and grass. Clover hay, timothy hay, field ploughed in August, top worked and ribbed up in October.

Rotation "D" (three years' duration).—Hoed crop, manured. Grain, seeded down with clovers and grass. Clover hay.

Soiling Crop, Rotation "R" (three years' duration).—Corn for early fall feed, manured. Peas and oats to cut green, seeded down with clovers and grass. Clover hay, to cut green.

Some characteristics of the above rotation, desirable under almost any conditions, are as follows:—

(1) Grain fields are always seeded down with clover, even though it be used only as a fertilizer, as in the case of the fifth year of rotation "A."

(2) Grass and clover seedings are heavy. Increased crops of hay and rare failures of a catch have justified them.

(3) Hoed crops form a large proportion of every rotation. An attempt to farm a small area without a hoed crop was not successful. Weeds could not readily be kept in check.

(4) No field is left in hay for more than two years. Our records show that the second crop almost always costs more than the first per ton, and that succeeding crops are very liable to be grown at a loss.

(5) Barnyard manure is applied frequently in comparatively small quantities, rather than at long intervals in large quantities.

The following record shows the comparison of the chief items in connection with these rotations:—

Cost, Returns and Net Profits or Losses of Rotations "A," "B," "C," "D," and "R."

Rotation.	Cost to operate per acre.	Value of returns per acre.	Profit or loss per acre, 1914.	Profit, average of 8 years 1904-11.
	$ cts.	$ cts.	$ cts.	$ cts.
A (five years' duration)	17 21	18 14	9 93	8 78
B (five years' duration)	17 13	18 63	1 50	9 03
C (four years' duration)	16 83	15 62	-1 21	8 15
D (three years' duration)	18 83	18 17	0 66	10 08
R (three years' duration)	18 76	19 49	0 73*	

*Records kept for two years only.

SHALLOW PLOUGHING AND SUBSOILING VERSUS DEEP PLOUGHING.

This experiment has been under way for eleven years. Two four-year rotations differing only in the preparation of the sod land for corn or roots as mentioned above are used but the results have not yet shown any decided advantage in favour of either method.

COMMERCIAL FERTILIZER AS A PART SUBSTITUTE FOR BARNYARD MANURE.

In 1913 there were completed five years of experiments designed to supply information concerning the relative fertilizing merits in regular farm rotation of:—

(1) No manure or fertilizer of any kind but pastured one year in four (records kept for two years only).

(2) Barnyard manure.

(3) Complete commercial fertilizer.

(4) Barnyard manure, together with commercial fertilizer. The results show a distinct advantage in barnyard manure alone over commercial fertilizer alone for this soil, but point to the possibility of combining the two to good advantage when barnyard manure is scarce or high in price.

DIVISION OF CHEMISTRY.

During the latter half of the year just closed the work of this Division has been carried forward under considerable difficulties, enlistments for active service and resignations having very seriously depleted the staff. The dislocation of the organization and the unavoidable interruption in the work, both investigational and casual,

will be appreciated when it is stated that within five months the staff has lost no less than four of the five assistant chemists upon whom, naturally, the major part of the analytical work falls.

Notwithstanding these adverse circumstances, much has been accomplished. The larger number of investigations in course for some time past have been proceeded with and some new ones, occasioned by conditions brought about by the European war, have been instituted.

As far as has been possible, the many and ever-increasing requests from farmers for analytical work and advice have been attended to, but owing to the circumstances already referred to there has resulted a large accumulation of these matters, and the Division asks for the exercise of patience on the part of its correspondents, who may rest assured that their requests will be dealt with at the earliest possible moment.

The "Patriotism and Production" campaign recently carried on throughout the Dominion has added greatly to the labours of the Division in many ways. Special articles, circulars, and bulletins have been written and issued on subjects of vital importance to a greater and more economical production of crops. The campaign also awakened a more lively interest in farming matters and resulted in a very large increase in the number of correspondents and of the samples of soils, feeding stuffs, etc., sent in for examination. Of these samples the record book of the Division shows that nearly 4,000 were received during the year—more than 1,000 over the number of the preceding year.

The investigation undertaken in 1912 to ascertain the influence of various cultural systems upon the moisture content of the soil has been continued on several of the branch Farms and Stations of Manitoba, Saskatchewan, and Alberta. Throughout the growing season, soil samples are collected on the plots under experiment with a view of determining the amount and distribution of the moisture to a depth of 6 feet. The results of the analyses should show the extent to which the soil moisture has been conserved by the several cultural operations. So far they have afforded evidence of the value of early and fairly deep ploughing on summer-fallows; of the subsurface packing of light soils and of frequent cultivation of fallows in order to check surface evaporation.

The examination of soils from districts under irrigation in Alberta has been continued, and a considerable addition to our knowledge of these areas has been gained. The more immediate objects of this work are to define the areas in which injurious alkali occurs and to ascertain the suitability of the districts in question for the carrying on of successful farming operations under irrigation. The progress of the analytical work has been much hindered by the loss of the assistants who had gained considerable skill in its conduct, but the prospects are now good for the more rapid prosecution of this wide and important investigation.

The European war entirely cut off the Canadian supply of potash compounds used in fertilizers. The sole source of these compounds for the world has been for many years the extensive mines at Stassfurt, Germany. With the view of supplying this deficiency, inquiry has been made as to our natural supplies of potash and, among several researches to that end, analyses have been made of the varieties of seaweed occurring more abundantly on the Pacific and Atlantic seaboards. Many of these seaweeds have been found rich in potash and nitrogen and evidently of great value for fertilizing purposes.

In this connection a practical trial is being made at Clark's Harbour, N.S., in the preparation of dried, ground seaweed for use as a fertilizer, and the prospects at the time of writing are good for the success of the undertaking.

The influence of environmental condition on the composition of wheat is the subject of a research commenced some years ago. It has already yielded results of national importance in showing that climatic conditions may profoundly modify the protein content of the grain, and incidentally that high temperatures accompanied by

a fairly dry soil during the filling out of the kernel—conditions characteristic of the wheat-growing areas of the Northwest—are conducive to a hard berry with a high gluten content. The scope of this work has been greatly extended and its value enhanced through the co-operation of the Meteorological Service, which has undertaken the tabulation of weather statistics at the various points throughout the Dominion at which we are conducting this experiment and the correlation of these data with the crop yields.

The experimental work with fertilizers begun two years ago at the branch Stations at Fredericton, N.B., and Kentville, N.S., has been continued. The season of 1914 has yielded results that, in the main, confirm those obtained in 1913, namely, that for potatoes on soil in fair condition as to richness and tilth, moderate dressings, say about 500 pounds, have proved the most profitable (though not necessarily giving the largest yields), and that in the larger number of trials better returns have followed the application of a mixture containing all three elements of plant food than where one or two of the elements only have been furnished. These are the two outstanding results of general application and value.

Plans have been perfected for extending the investigational work with fertilizers on systematic and scientific lines. For the past two years preparations for this have been made at five of the branch Farms and Stations by cropping, without manure or fertilizer, several series of plots. The scheme of fertilizing has been carefully thought out and made as complete as the size of the area set apart for the work would permit. It is proposed to put these plots under a four-year rotation: first year, potatoes, roots or corn; second year, grain seeded with clover and timothy; third and fourth years, hay.

The analysis of sugar beets grown on fourteen of the branch Farms during the season of 1913 has given most satisfactory results, thus furnishing further evidence of the suitability of the soil and climatic conditions in the widely distant parts of the Dominion for the production of roots rich in sugar. The varieties tested were Improved Vilmorin A and B, Très Riche, and Klein Wanzleben, the seed being obtained from Messrs. Vilmorin, Andrieux et Cie., Paris, France. This investigation dates back to 1902, so that the results are becoming increasingly valuable for those inquiring as to the possibilities of Canada as a sugar-producing country.

Among many fodders and feeding stuffs examined may be mentioned a series of field roots—mangels, turnips, and carrots—grown on the Central Farm, Ottawa. The object of this investigation, now in its ninth year, has been to ascertain as far as might be possible by analyses, the relative feeding value of the various classes of roots and of the several varieties of each class. In the mangels, more particularly, it has been found that large differences in dry-matter content exist among the varieties as commonly offered for sale.

The number of well waters examined for farmers during the year was 336. From the correspondence on the subject it is evident that an increasing interest is being taken in the matter of the home water supply, and that, speaking generally, farmers are becoming more and more alive to the desirability of a pure supply both for domestic and stock use.

The nitrogen content of the rain and snow as falling at Ottawa (Central Experimental Farm) has been determined. During this eighth year of the investigation, ending February 28, 1915, the precipitation has been below the average, but this did not reduce the amount of available nitrogen for enrichment of the soil per acre, furnished by these sources. The average for the previous seven years is 6·182 pounds, the amount for the past year, 7·897 pounds per acre.

The samples submitted for examination and report by the Meat Inspection Division, Health of Animals Branch, during the year 1914-15, numbered 662. These comprise dyestuffs, preservatives, pickling solutions, spices and condiments, evaporated apples, preserved meats, etc., collected at the various packing houses and canneries

throughout the Dominion. This important work, which is steadily on the increase, calls for a large amount of skilful and careful analytical work, necessitating in many cases the devising of special methods which can only be determined upon after considerable time spent in research.

HORTICULTURAL DIVISION.

The experimental Farms and Stations, situated as they are in many parts of Canada where both the summer and winter climates vary in a marked degree, give abundant opportunities for finding out what are the best horticultural crops and varieties to grow in Canada and how best to grow them.

WORK AT THE BRANCH FARMS AND STATIONS.

The Experimental Station at Sidney, Vancouver Island, B.C., one of the newer Stations, received considerable attention from the Horticultural Division in 1914. During that year there was no superintendent and, in order not to lose any time, plans were made at Ottawa for the plantations there, and material was ordered. As a result, some 15 acres of fruits were set out. Among the fruits being tried are apples, peaches, pears, plums, cherries, apricots, nectarines, quinces, persimmons, figs, and citrus fruits. Of nut trees, there are English walnuts, chestnuts, filberts, and almonds, and there will be others later on. Plantations of holly and cascara were also set out. Provision was made in the plans for a test of many species of ornamental trees, shrubs, and herbaceous plants, a large number of which were set out in 1914.

At the Experimental Station, Fredericton, N.B., another of the newer Stations, 11 acres of orchard were set out, consisting mainly of trees of apples, pears, plums, and cherries. These orchards are arranged both for cultural experiments and the testing of varieties. An addition of 3½ acres was made to the orchards at the Experimental Station at Ste. Anne de la Pocatière, Que., where a good start had been made the year before. At the new Station at Lennoxville, Que., the land was prepared for an orchard to be planted in 1915. A nursery was established to make provision for trees needed on the ornamental grounds when the land is ready.

At the older Farms and Stations there was considerable development in the horticultural work. Perhaps one of the most interesting experiments on the prairie Farms at present is the testing of many thousand seedling trees raised from the hardiest of the Russian apples. It is hoped to obtain from this large number some varieties of good size which will be hardy and better in quality than any of those available at present. There was a marked difference in the hardiness of individual specimens in 1914. The cross-bred apples originated by the late Dr. Wm. Saunders, though small in size, continue to show superior hardiness to any of the large varieties of apples. These have now fruited at all the prairie Farms. So far, the best crops of true apples have been obtained at the Experimental Station, Lethbridge, Alta., where a number of varieties bore in 1914 as in 1913 also.

HORTICULTURE AT THE CENTRAL FARM.

The new greenhouses recently erected for the Horticultural Division have proved very satisfactory, and a number of interesting experiments have already been tried there. The growing of greenhouse grapes in large pots is practically unknown in Canada and, to show what might be done, these were given a trial and good results were obtained. Black Hamburgh and Foster Seedling were two of the best varieties. By growing grapes in pots, persons with small greenhouses need not devote a part permanently to grapes, but may put the pots outside when the fruiting season is over and afterwards store the vines in a cellar. Tomatoes grown in 12-inch pots also gave good results. There was an excellent show of the best chrysanthemums in November. Plant-breeding work was carried on under glass. Crops of melons, cucumbers, cauliflowers, beans, and lettuce were also raised.

The fruit crop was a good one in 1914 at the Central Experimental Farm, it being clean and well grown. As fire pots for protecting crops from frost have been used successfully in the Western States, four hundred of these were purchased in 1914 for experimental work, and while the season was particularly free both from late spring and early autumn frost, some interesting results were obtained in showing that the temperature could be raised several degrees by this means.

Especial attention is being given to the breeding of new fruits, vegetables, and flowers. Early-bearing varieties of fruits, early strains of vegetables, and improvements in a few kinds of flowers were some of the lines on which this work was continued in 1914.

Experiments with ornamental plants were continued, and very useful additional information in regard to herbaceous plants was obtained. The rose garden is now a striking feature of the ornamental grounds at the Central Farm.

DIVISION OF CEREALS.

The season of 1914 was, on the whole, not very favourable for cereals. Severe drought was experienced—at one period or another—over large areas of country. Western Quebec and eastern Ontario suffered chiefly during the early part of the season, while southwestern Saskatchewan and southeastern Alberta were very seriously affected throughout the whole summer. Districts which had a fair rainfall produced excellent crops. Particularly successful were central Alberta, southwestern Ontario, and parts of the Maritime Provinces.

Cereal crops on the Experimental Farms and Stations were generally good, the methods of seed selection and soil cultivation employed being such as to reduce to a minimum the damage caused by unfavourable weather of any kind.

While the experimental work with cereals was somewhat interfered with at two or three of the Farms by the abnormal conditions, the results of the season were, on the whole, satisfactory so far as yield of grain is concerned.

NEW STATIONS.

Cereal investigations are always carried on at a great disadvantage when the land is lacking in uniformity. It is therefore usually impossible to begin successful tests of varieties during the first two or three years after the establishment of a new Station.

The soil difficulties at Cap Rouge, Que., are now clearly understood, and as the chief of these can be easily remedied (by the application of lime) it is expected that this year the test plots will give much more satisfactory results than they have hitherto done.

Suitable land has been set aside for the growing of cereals at Ste. Anne de la Pocatière, but trial plots will not be established until an efficient system of drainage has been arranged. This will probably be done during the present year.

A beginning is to be made at Fredericton this spring. While the land is as yet rather uneven for experimental work, it is believed that valuable results can be reached by the plan which is being adopted, namely, to sow four plots of each of the varieties under trial.

At Kentville, N.S., it is proposed to grow only a very small number of the best varieties, and to have a large plot or a small field of each sort.

A series of plots will be sown this spring at Invermere, B.C., on irrigated land. A small number of varieties will be tested—sufficient, however, it is believed, to serve as a guide to farmers in the Columbia valley. These plots will be in duplicate, one series receiving more water than the other.

MARQUIS WHEAT.

Marquis wheat has won its fourth successive triumph in international competitions. The latest victory was at the Dry-farming Congress at Wichita, Kansas, last autumn, when an exhibit of Marquis grown by Mr. Seager Wheeler, of Rosthern, Sask., was awarded the highest score.

Marquis now holds, almost undisputed, the first place among varieties of spring wheat in Canada. It is also highly esteemed in parts of the United States which touch the Canadian border; and it has given an excellent account of itself in Colorado, at high altitudes, where early-ripening varieties are needed.

PRELUDE AND PIONEER WHEATS.

These very early-ripening varieties, which have been before the public for only a short time, have shown themselves well adapted for some districts for which there has hitherto been no suitable sort. Prelude, by its extraordinary earliness, makes wheat growing profitable in localities where ordinary varieties are almost always damaged by frost late in August; and Pioneer, though a less useful sort, is the only very early wheat yet introduced which is at all suitable for dry districts.

OTHER GRAIN.

While the work with the other kinds of grain is unavoidably receiving less attention than is given to spring wheat, many new cross-bred and selected sorts of barley, peas, flax, and oats are under test. The best of these will be brought to the attention of the public just as soon as they have been sufficiently tested. The premature introduction of imperfectly studied varieties is being carefully avoided.

MILLING AND BAKING TESTS.

The usual extensive tests of new varieties of wheat have been carried on during the past winter. The studies of the effects of storage on flour have also been continued, and experiments have been conducted with a view to obtaining more precise information in regard to the exact conditions necessary for the production of the best kinds of bread.

DISTRIBUTION OF GRAIN AND POTATOES.

The annual free distribution of small samples of seed grain and potatoes is being conducted as usual. Owing to the very dry weather last season at some of the Farms where the seed grain was produced, the quality of part of the material for distribution is not quite so good as usual; but great care is taken to ensure that only grain of the very highest possible degree of purity is sent out.

As the experience of many years has shown that potatoes raised at Ottawa are usually inferior for seed purposes to those produced in the cooler climate of the Maritime Provinces, arrangements are being made to distribute, this year, only potatoes grown in New Brunswick. We believe that this seed will give entire satisfaction to the farmers of Ontario and Quebec.

DIVISION OF BOTANY.

After the return, towards the end of April, 1914, of the Dominion Botanist from Europe, where he attended, as the official delegate of the Dominion, the International Conference of Phytopathology held at Rome, arrangements had to be made to fill the vacancy on the staff of the Division caused through the resignation of the chief assistant, Mr. J. W. Eastham, B.Sc., who was appointed to the post of Provincial Plant Pathologist for British Columbia.

Prof. John Adams, M.A., formerly connected with the Royal College of Science, Dublin, Ireland, received the appointment as Assistant Dominion Botanist.

Mr. F. Lisle Drayton, B.S.A., a graduate in biology from the Macdonald College, was appointed Assistant in Plant Pathology and Bacteriology.

The work of this Division has steadily increased. The special attention which is being paid to the control of plant diseases and to a general plant pathological survey of the Dominion, emphasizes the necessity for considerable experimental work and increased activity in this direction. It appears that, no matter how recently land may have become utilized for agricultural purposes, the economic crops soon fall a victim to destructive diseases, which may cause either a direct reduction in yield, or considerable trouble through loss of trade.

DESTRUCTIVE INSECT AND PEST ACT.

A striking example of the latter is afforded by the disease "powdery scab" affecting potatoes. This disease, known for nearly a century in Europe, has been recorded for the first time on the continent of America. Its presence here was regarded by the Dominion Botanist as of scientific interest, and was recorded merely from this point of view. It resembles closely the common potato scab, and is in the opinion of nearly all plant pathologists who have had experience with it, a minor disease, which deserves no more attention than the well-known common scab, which is distributed all over the world. Even under Canadian conditions, the disease, which has been most carefully watched since it first came under observation, has shown itself certainly more harmless in effect than "late blight" or "black leg" or other well-known potato diseases.

There was little reason for this disease to become practically the most notorious plant disease known in Canada. As is well known, the United States authorities considered the disease in quite a different light. They regarded it, because of their having had no actual experience with it, as very suspicious and of sufficient importance to warrant their placing an embargo on all Canadian potatoes. This action made the disease at once—at any rate to the growers and shippers of the Dominion—the most important potato disease. Under ordinary circumstances, the disease would have been dealt with in the manner its minor character deserved, but the embargo affected very seriously the market for the crop of Eastern Canada. For this reason, negotiations were begun by the expert of our department, who was instructed to discuss the conditions under which the embargo would be raised. In June, the Dominion Botanist interviewed the United States Federal Horticultural Board, who were prepared to permit the importation of potatoes, providing certain conditions would be fulfilled. These conditions required certification of all potatoes, after inspection of farms and of the potatoes prior to shipment from the defined so-called "infected area" within the Dominion. The conditions were regarded as very complicated, and their enforcement would require a large staff of inspectors and a considerable expenditure. The department, however, desirous of accommodating the agricultural population of Eastern Canada, who are prominently engaged in raising potatoes, caused these regulations to be explained to the shippers who were most actively interested, i.e., those of New Brunswick. The same conditions were laid by the United States authorities upon the state of Maine (and later New York), on finding these states infected by the same disease. The Canadian shippers unanimously agreed to accept the conditions, and, on representation to this effect being made, the embargo was temporarily lifted from Canada under the conditions exacted. (See circular No. 6, entitled "Regulations under the Destructive Insect and Pest Act governing the Importation, Sale, Shipment, and Exportation of the Common or Irish Potato (*Solanum tuberosum* L.)."

Inspection of potatoes began in December, 1914. A number of inspectors were specially instructed and trained in the laboratories and under the direct supervision of the Dominion Botanist. The work of inspecting all potatoes for export to the United States and to the disease-free area of the Dominion was immense, but was carried on faithfully and to the best of human possibility. From December 13, 1914, to February 26, 1915, 49,343 bushels of "first-grade potatoes" were certified for export to the States, and up to March 31, 1914, 36,689 bushels for the disease-free area of the Dominion. Table potatoes were inspected and certified for the Dominion during the above period, amounting to 440,038 bushels. Altogether, 526,070 bushels of potatoes have been inspected and certified during these months. However, on February 26, a car of Canadian potatoes was held up by the United States inspectors because of the potatoes having been found to be infected with powdery scab. On inquiry it was learned that the official inspector of the United States found, after seven hours' search, two potatoes very slightly affected with this scab. In accordance with the United States regulations relating to the importation of foreign potatoes, the permits issued by the board were cancelled, and further permits were refused. Since then no further exports of Canadian potatoes to the United States have taken place.

From our experience with powdery scab in Canada, and from the experience of plant pathologists of repute in Europe, we were more inclined than ever to the view-point that this disease was not of a character to warrant any such drastic measures. The time, no doubt, will come when the United States authorities will change their attitude towards the disease.

The inspection of the potatoes, quite aside from the question of powdery scab, has been found to improve greatly the quality of potatoes shipped outside the infected area. This work is being greatly appreciated by the shippers and a large number of farmers. They both realize that the continuation of the inspection would be most beneficial. If it is thought desirable to continue this work, the shippers have expressed their readiness to pay an inspection fee, which attitude is considered quite correct. Meanwhile, experiments are being conducted by the Division relating to effective control measures to be taken against the disease.

EXPERIMENTAL AND OTHER WORK OF THE DIVISION.

A large number of specimens of diseased plants were sent in for examination and advice. The experimental work connected with plant diseases included a series of experiments on potato diseases. The prevention of common scab, investigation into the nature, cause, and prevention of more obscure diseases of potatoes, as mosaic, leaf roll, curly dwarf, and internal streak or net necrosis are still receiving the attention of the scientific staff of the Division. The Dominion Botanist, during July and part of August, in company with a number of United States plant pathologists, visited a large number of potato fields in the United States to study the diseases as they occur in the fields. Such visits have been found of great value to the growers, who have taken a keen interest in them, and who will benefit from the experience, explanations, and suggestions for the control of various troubles. The work will be continued this year in various localities of the Dominion.

Mr. J. Adams was absent for several weeks in Prince Edward Island, where he delivered a series of lectures explaining the question of powdery scab and the new potato regulations.

Miss Faith Fyles, an assistant in the Division, was absent in the Western Provinces during the summer to collect exhibition specimens of the common weeds. She also superintended the growing of these weeds in Ottawa to secure seedlings at their various stages. It is intended to prepare a comprehensive exhibit of the weeds of Canada, showing their development from the seed to the mature plant. Farmers who are in a position to recognize the noxious weeds in their seedling stages, and who commence

at such time their eradication, will find the weed problem far less troublesome than those who attack the weeds when they have matured and probably already provided for their perpetuation. The specimens collected have been exceedingly well prepared, and have been arranged for exhibition in a unique and original manner, which will prove most useful.

The number of weeds and wild plants sent in for identification was very large, about 1,000 having been identified and reported upon.

The usual progress was made with the herbarium of the Division and in the botanic gardens. Considerable time was spent in arranging, cataloguing, and indexing the botanical library.

The St. Catharines Field Laboratory is proving of greater value and assistance every year. Very valuable experiments in the control of fruit-tree diseases are being conducted by Mr. McCubbin, the assistant in charge.

A detailed account of the work of the Division of Botany will appear as usual in connection with the Farm Reports.

DIVISION OF ANIMAL HUSBANDRY.

The scope of work of this Division, as in the past two years, includes directly the care, breeding, housing, and marketing of all classes of live stock and their products on the Central Experimental Farm, together with the testing of foodstuffs and the methods in the care and management of stock and of all machinery pertaining thereto. In consultation with the branch Farm superintendents, this Division also assists largely in these various operations on all the branch Farms where live stock is maintained, thus systematizing and consolidating the live stock experimental work.

The live stock work on the Central Experimental Farm was carried on under most unfavourable circumstances during the first part of the fiscal year. The lack of proper buildings was a serious handicap both in the routine work of breeding and feeding, and also in the experimental work along these lines. The summer feeding work was most discouraging owing to the severe drought, which caused extremely poor pasture on the all-too-limited pasture area. The green feed supplied by the Field Husbandry Division to assist in supplementing the shortage of pasture was also a partial failure. Hence, all classes of live stock were fed under most trying circumstances. However, the excellent crop of corn for ensilage facilitated the live stock operations in the fall and winter.

There are now 503 head of live stock in the stables, made up as follows: 159 head of cattle, 26 horses, 98 sheep, and 220 swine.

HORSES.

The horses on the Central Experimental Farm are expected to do all labour connected with the various Divisions. This number of horses includes also four pure-bred Clydesdale mares and four grade Clydesdale mares of good quality and breeding. Breeding operations were started with these mares in the fiscal year ending March 31, 1914. Unfortunately, the four foals were all lost, due to being carried from two to four weeks over time. Two of the mares, more or less subject to intestinal trouble, were lost during the year. These are the only serious losses in our live stock work, and are much to be regretted. A number of the mares are in foal again, and with a promise of better success. Experimental work along the lines of feeding, care, management, and housing of pregnant mares and foals will be carried on.

The horse labour supplied to the various Divisions on the Central Experimental Farm amounted to 7,174 days, which, at the conservative value of 70 cents per day, gives a total return of $5,021.80.

No experimental horse feeding work was conducted during the year.

DAIRY CATTLE.

The pure-bred dairy herds, as previously reported, are Ayrshires, Canadians, Guernseys, Holsteins, and Jerseys. All these herds have made a normal growth during the year, and have given satisfactory returns.

The grading experiment with grade Ayrshires and grade Holsteins has been continued with marked success, and the cows have given excellent returns.

DAIRY CATTLE FEEDING EXPERIMENT.

Many new phases of dairy cattle feeding experimental work have been taken up during the year. Some of the results of these experiments are found in the detailed report of the Dominion Animal Husbandman. Briefly, the lines of work studied are: (1) a continuation of the investigation of the value of molasses and molasses meals in replacing a good grain mixture for milch cows: (2) an investigation of the value of molasses in replacing succulent roughages, such as roots and ensilage; (3) the value of the various grades of elevator by-products (screenings) for the feeding of milch cows; (4) the value of molasses in making some of the elevator by-products more palatable; (5) an investigation as to the value of the various patented calf meals as compared with a good home-made calf meal, with and without whole milk, skim-milk, and buttermilk, in calf feeding.

MILKING MACHINES.

With the completion of the new dairy barn in the fall of 1914, the Sharples and the Burrell-Lawrence-Kennedy milking machines were reinstalled. A series of experiments comparing these two machines with each other and with the best hand milking, from the standpoints of commercial, bacteriological, and pathological values, was started. This experiment will continue over a period of a year or more. Mention, however, is made of some of the results to date in the report of the Dominion Animal Husbandman. In addition to these two machines there are also being tried the Empire and the Lister milking machines.

DAIRY COW RETURNS.

It will again be noted that the quality of the dairy cattle on the Central Experimental Farm has made a marked improvement. The average profit per cow has again increased over $8 per head per annum. Particular attention is drawn to the fact that many of the best cows have not completed their lactation periods at the end of the fiscal year, hence the following table is no definite criterion as a comparison of the breeds. The following is a brief summary showing the returns of some of the cows, the profits being based on the following valuations: Butter, 30 cents per pound; skim-milk, 20 cents per hundredweight; pasture, $1 per head per month; hay, $7 per ton; straw, $4 per ton; green feed, $3 per ton; and meal, $25 per ton.

No. of Head.	Age.	Breed.	Average Days in Milk.	Average Pounds Milk produced.	Average per cent Fat.	Average Profit over Feed between calvings. (Labour, Manure and Calf not included).
	Years.					$ cts.
50	3 and over	All breeds and grades	364	8,108·3	4·47	68·74
5	3 "	Ayrshire	342	8,148	4·15	58·50
5	3 "	Canadian	386	7,863	4·80	81·67
5	3 "	Guernsey	352	7,263	5·55	90·31
5	3 "	Grade Ayrshire	343	9,523	4·02	77·07
5	3 "	Grade Holstein	452	12,976	3·57	92·23
2	2 "	Holstein	408	7,680	3·63	42·22
4	3 "	Jersey	372	7,998	5·68	110·41

Attention is drawn to the fact that butter valued at 30 cents per pound is equivalent to milk at only $1.65 per hundredweight; yet, in reality, the manufacture and sale of cream cheese, Coulommier cheese, and certified milk, with a large part of the milk, has netted $3 per hundredweight. The above valuations are useful for the comparison of production with the average herds throughout Canada.

BEEF PRODUCTION.

It is to be regretted that, owing to the lack of buildings, no beef-breeding work or beef-feeding investigation work has been conducted on this Farm during the past year.

SHEEP.

Although the great difficulty of the sheep investigation work, namely, the shortage of available land, continues, yet better results than usual have followed the work of the past fiscal year. Breeding work on a small scale with Shropshires and Leicesters has been most successful. Aside from this, a feeding experiment with 120 lambs, investigating the feeding value of elevator by-products and screenings, was conducted, giving valuable results and showing a reasonable margin of profit.

SWINE.

Considering the shortage of pasture, another successful year is to be reported for swine husbandry. The three breeds of swine, namely, Yorkshire, Tamworth and Berkshire, have bred exceptionally well, and there are now in our pens one of the finest lots of breeding stock in Canada.

Several lines of investigation work in the feeding of swine were conducted. Briefly these are: (1) the value of tankage and other foodstuffs in feeding pregnant brood sows, both in the winter and summer; (2) the value of tankage and other meals as milk substitutes, fed in conjunction with other meals to young pigs during and after weaning; (3) the value of elevator by-products (screenings) in feeding four-month shoats for the market. Very valuable data have been acquired in these experiments, which may be found in the report of the Dominion Animal Husbandman.

LIVE STOCK BUILDINGS.

Under my supervision, the Animal Husbandry Division has during the past year finished the preparation of plans and largely supervised the erection of the new dairy barns at the Central Experimental Farm, Ottawa. Illustrations and brief specifications of these barns may be found in the report of the Dominion Animal Husbandman.

Many plans of farm buildings, and specifications for the same, have been sent out to farmers free of charge. It is to be hoped that this work will stimulate the keeping of better farm buildings throughout Canada.

MISCELLANEOUS.

The correspondence of this Division pertaining to the feeding, breeding, care, and management, and housing of animals, together with the prevention and treatment of many of the minor ailments of all classes of stock, has largely increased during the past year.

The Dominion Animal Husbandman, in attending to his duties outside the Central Experimental Farm, has officially visited all of the branch Farms in Canada where live stock work is being conducted. In addition to such official trips, both he and the Assistant Dominion Animal Husbandman have made many trips, attending

a large number of meetings in various parts of Canada, judging at numerous exhibitions, and studying live stock conditions and the needs for experimental and demonstrational work relating to live stock.

DIVISION OF FORAGE PLANTS.

The work of the Division of Forage Plants has, during the year, been carried on with the following objective points:—

(1) The ascertaining, by means of variety tests, of the comparative value, for different parts of Canada, of many varieties of the different classes of forage plants. This work does not only include such varieties as are accessible to farmers through the ordinary channels of commerce at present, but also those hitherto unknown in Canada, which for some reason or other may prove of value to Canadian agriculture.

(2) The production, by breeding according to well-established scientific principles, of new varieties of forage plants superior to those now available. The aim of this work is not only to raise the quality and yielding capacity of forage crops in general but also to produce varieties especially adapted to the various climatic and soil conditions existing in different parts of the country.

(3) The gaining of a thorough knowledge of wild grasses and other plants forming part of wild hay or of natural pastures.

(4) The securing of data bearing on the possible production of seed of forage plants, particularly of field roots, in different parts of the Dominion.

VARIETY TESTS.

At the Central Experimental Farm, as well as at the branch Farms and Stations, a great number of varieties of forage plants, principally of Indian corn, turnips, mangels, carrots and sugar beets, have been tested as to their comparative value.

In all these variety tests the duplicate-plot system, which was introduced for forage plants in 1913, has proven to be of striking value, inasmuch as errors liable to result from variation in the productiveness of the soil in different parts of the experimental fields have been eliminated to a very great extent. The duplication of variety tests has, as a matter of fact, proven not only extremely useful, but even absolutely necessary for the gaining of correct data bearing on the comparative value of different varieties.

In order to secure, furthermore, as accurate a knowledge as possible of the relative value, from the food standpoint, of different varieties, those tested at the Central Experimental Farm have been judged not only by their yielding capacity but also by their chemical composition. Their real value has been calculated from tonnage and chemical composition taken together. In this way the value of the varieties, being expressed in food units, has been more accurately ascertained than previously, when the yield itself was being used as the only basis for the valuation.

BREEDING WORK.

Leguminous Forage Plants.—The breeding work with clovers and alfalfa, started in 1912, is now well under way. Two main objects, viz., increased hardiness and increased yielding capacity, furnish the basis for this work, which promises to lead to very important results.

Breeding for hardiness and increased yield in clovers and alfalfa is made possible by the fact that the forage plants mentioned do not constitute uniform "varieties." On the contrary, they are composed of a large number of distinct types differing from each other as to hardiness as well as to yielding power. These characters, furthermore, have proven to be of a hereditary character, i.e., they are transmissible

from one generation to another. This being the case, the breeding of new alfalfas and clovers simply means isolation and propagation of those types of the said forage plants which possess superior characteristics in the directions mentioned.

In breeding for hardiness, the selection of hardy types is performed by Nature herself. Severe winters and adverse conditions in the early spring weed out all tender types, leaving uninjured only those which possess hardiness enabling them to survive. By propagation of the surviving individuals in an experimental field a crop is secured in which all the individuals are hardy and in which, as a consequence, winter-killing resulting from tenderness is reduced to a minimum.

That, really, by propagation of surviving individuals, hardy varieties can be produced, has already been demonstrated in several instances. As an example may be quoted the results of alfalfa experiments at the Substation at Fort Vermilion, Alta. At this Station, alfalfa has been experimented with for many years, but, unfortunately, without success. In 1913, alfalfa seed was secured from a few plants which had proven able to withstand very severe winters. This seed produced a crop, in which winter-killing was hardly perceptible.

Similar results from other parts of Canada all confirm the correctness of the idea used by the Division of Forage Plants as a basic principle in breeding for hardiness, that, namely, hardiness of alfalfa can be achieved by propagation of hardy individuals, no matter from what " variety " they originate.

In breeding for increased yield, so-called pedigree breeding is being applied, i.e., the breeding is being started from individual plants possessing superior characters. In order to secure material for this work, a number of outstanding plants were either self-fertilized or cross-fertilized in 1913. From the seed thus obtained a number of individual plants, totalling over two thousand, have been secured and transplanted in the experimental field for further study.

Breeding work similar in character to that outlined above is also well under way with red clover. The work with red clover has among other things revealed a fact which may prove of the greatest importance for those parts of Canada where a high degree of hardiness is essential for successful clover growing. It has been found that certain types of red clover are perennial in character, i.e., are able to live four years or more. Efforts are being made to produce, from such plants, a perennial and, as a consequence, perfectly hardy red clover variety.

Grasses.—A total of about three thousand timothy plants secured from self-fertilization of individuals having certain characters indicating superior forage value are being studied. The nature of the breeding work with timothy, as explained in previous reports, makes it impossible to expect results after only a few years' breeding work. The results obtained so far indicate that the object aimed at, viz., the production of uniform varieties of a superior forage value, will be materialized in due time.

Breeding work, similar to that under way with timothy, has also been started with Orchard grass, Western Rye grass, Meadow Fescue, and other grasses.

WILD GRASSES.

The herbarium material of grasses and kindred plants necessary for the correct understanding of the nature and merits of natural pastures and of hay made from wild grasses is steadily being increased. In addition to a vast collection of grasses, made principally in British Columbia, about 800 sheets of European grasses and sedges have been secured through exchange.

A great number of specially selected grass specimens have been collected for exhibition purposes. The majority, representing 175 different species, are being exhibited in the Canadian pavilion at the Panama-Pacific International Exposition, San Francisco, California.

SEED PRODUCTION.

With a view to improving old varieties of field roots by breeding, preparatory experiments were started with mangels and turnips on a small scale in 1913.

In 1914, when the conditions in the root seed producing countries of Europe threatened to make a normal supply of seed impossible, steps were taken to secure data bearing on the possibility of producing field root seed profitably in Canada. As large quantities as possible of suitable mangels and turnips were selected as seed roots for the year 1915.

POULTRY DIVISION.

GENERAL DEVELOPMENT OF THE WORK.

Since the enlargement of the Poultry Division two years ago, the work has been gradually increasing, and the demand for still greater expansion is more and more apparent. For, though so much has been done to encourage the producer, Canada, according to the Customs returns, even yet does not produce eggs sufficient for her own requirements.

Eleven of the branch Farms and Stations this year are equipped for work in poultry and practical demonstrations are being conducted thereat. On the Central Farm the stock has been more than doubled during the past year, and good beginnings have been made with turkeys, geese, and ducks.

NATURE OF THE WORK.

This Division aims to help the farmer who keeps a small flock of hens as well as the man who depends upon the flock for a livelihood, and with this end in view many of the problems that face the producer are receiving attention, and as the laboratory equipment at Ottawa is increased, research in more of these will be instituted. Among the questions that are receiving immediate attention are: Better housing, cheaper feeds, healthier stock, more suitable varieties, decrease of mortality, incubator problems, better and stronger fertility, higher average egg yield, larger eggs, better preparation for market, best methods of shipping eggs for hatching, day-old chicks and breeding stock, the production of early winter eggs, a more even distribution of what the producer has to sell, the practicability of water fowl on the farm, the prevention or cure of blackhead in turkeys, as well as a number of other common diseases to which poultry of all kinds are subject.

BUILDINGS.

The three small buildings erected at the Central plant a year ago have proven very helpful in the work. The experimental breeding house has made it possible to carry on some special mating experiments. The cockerel house has served the purpose for which it was originally intended during the winter months, and has proven to be a satisfactory brooder house for chicks in the spring and summer; the feed and storehouse has rendered this end of the work more convenient, and the basement is being utilized as an incubator cellar.

The new administration building which was expected during the year has not yet been built and, because of this, the old buildings are still retained, but it is hoped that this building will be available very soon, when laboratory space will be provided and more investigational work taken up.

THE WATER FOWL PLANT.

Upon the area of land and water which was inclosed last year for a duck pond, a small cottage for the attendant has been erected. During the year this plant was utilized for the water fowl, and breeding turkeys also were placed there quite recently.

This makes an ideal spot, especially for the water fowl, as considerable water is included inside the fence. Small yards reaching to an artificial pond have been constructed for the use of the breeding stock early in the spring before the water comes into the canal.

This addition to the Central plant provides a much-needed range and makes it possible to carry on work that has been in contemplation for some time. It also adds to its general appearance by turning wild land into a water-fowl park.

THE EQUIPMENT AT THE BRANCH FARMS.

The poultry plant at each of the branch Farms and Stations is more for the purpose of demonstration than experiment, and therefore comprises what might be considered ideal conditions for a farm poultry plant that is run on a commercial basis. Some of these Farms have their complete equipment, which includes houses of various types and sizes, sufficient in all to accommodate between three and four hundred laying hens; incubator and brooder equipment to reproduce from one-half to two-thirds of the flock each year; an administration building, the basement of which is used for an incubator cellar, the first floor for office, bed-room and feed-room, the attic for store-room.

NUMBER AND VARIETIES OF STOCK.

The stock includes ordinary fowl (hens), turkeys, geese, and ducks. The varieties as a rule are those which are considered to be more or less of a general-purpose character, and especially suitable for farm conditions. Hens, water fowl, turkeys, and guineas are bred at the Central plant, while all the branch Farms that have poultry plants keep hens, though only those specially situated have turkeys or water fowl.

The old hens, that is, those birds that have passed through their second laying season, are sold immediately after the breeding season, usually in June. The selling of these at this time gives more room on the plant for the growing chicks; it also puts on to the market poultry flesh when it is comparatively scarce and consequently high in price, and indirectly it assists the market later on in the summer and fall when, as a rule, poultry meat of all kinds is marketed.

At the Central Plant.—During the past year the stock at the Central Experimental Farm has been materially increased. On January 1, 1915, there were 849 birds, 146 of which were water fowl, turkeys, and guineas. Of the fowl, the Barred Rocks predominated, with White Leghorns second. These are followed by several pens of White Rocks and White Wyandottes and smaller lots of White, Buff, and Black Orpingtons, Black and Brown Leghorns, and Black Minorcas, besides single matings of several other varieties. In ducks there are several matings of Indian Runners, Pekins, and Cayugas, and a pen each of Aylesburys and Rouens. In geese, Toulouse, Embden, African, and Wild were represented, and the variety of turkeys was Bronze.

At the Branch Farms.—Seventy-five per cent of the hens on the branch Farms belong to the general-purpose breeds, such as Rocks, Wyandottes, etc. The remaining 25 per cent are White Leghorns, the most of which are at Agassiz, B.C., and Lethbridge, Alta., where the climate is better adapted to tender varieties, but even there it is found that the general-purpose breeds are giving better satisfaction, and as a consequence the proportion of lighter breeds will be diminished.

About 300 laying hens are kept at each of the branch Farms. As a rule, 200 of these are pullets and 100 year-old hens. The pullets are tested the first year by the trap-nest and are fed for egg production, and 100 of the best of these are kept until the following year, when from them eggs are taken in the breeding season for hatching purposes.

With this arrangement it is necessary to mature 200 selected pullets each year; this means that at least five or six hundred chicks are raised to maturity. About 50 per

cent are cockerels, the best of which are retained for selling as breeders to the farmers. Of the 300 pullets, 200 are selected for the laying pens.

From one to four varieties are bred at the branch Farms, though it is not the intention to keep too many varieties but rather to eliminate those which are the least satisfactory and confine attention to the one or two which prove most practical for the locality.

MEETINGS.

The demand for speakers has been, if anything, greater than usual. Mr. Fortier has been absent 111 days during the year, has lectured at sixty-one different places and judged at eighteen shows throughout Quebec and Ontario, and the reason that he did not get to more meetings was because of his inability to leave the office. Mr. Robertson has attended a few but has been unable to be absent from the plant for any length of time, though numerous requests have come for him, especially to judge. Mr. Elford attended a number of meetings, but his work here and in connection with the branch Farms has made it impossible for him to attend very many. He made two visits to the branch Farms and Stations inspecting the poultry work, and a number of "Patriotism and Production" meetings were attended by him during the "campaign."

CORRESPONDENCE.

The correspondence of the Division is very heavy. Information in circular form assists considerably, but the number of questions that have to be answered individually seems to be growing.

THE TOBACCO DIVISION.

The scope of the Tobacco Division was enlarged at the beginning of the season of 1914-15, by the appointment of two crop inspectors, one for the province of Quebec, the other for Ontario.

The season of 1914, though not altogether favourable for tobacco growing, allowed of the harvesting of an average crop, although slightly later than in a normal year; in Quebec, the establishment of the plantations was considerably retarded by a prolonged drought. In general, however, the crop ripened sufficiently early, except in those plantations harvested in September, the early part of the month being marked by continued rain.

CENTRAL EXPERIMENTAL FARM.

Plantation.—Among the varieties lately tested is a large number of types of the small-leaved Canadian tobaccos and also some large-leaved pipe tobaccos such as "Gold Leaf" and "Maryland," etc. In spite of a somewhat cool season, all these tobaccos were harvested well before the first frost.

An abundant supply of tobacco seed was obtained, which was distributed in part during the winter of 1914-15.

The drying process was carried out without difficulty or delay.

Fermentation.—The tobaccos of the 1914 crop were tested at Farnham but, during the summer, an experiment in betuning with part of the 1913 crop, was carried on at Ottawa. The results were interesting, especially with a view to the preservation of tobacco from injury by mould.

STATION AT ST. JACQUES, QUE.

The seed treated with formalin grew well. The establishment of the plantation, however, was hindered by drought, and the crop harvested was a little below the average.

A good selection of Yamaska and of Big Ohio × Sumatra was made, notwithstanding, and some hybridizing was done. The work of drying in the open field, which had been successfully carried out in 1913, was made easier by the use of stronger and more suitable material for the drying frames. The drying process was completed in good time, with the aid of charcoal stoves.

STATION AT FARNHAM, QUE.

Although there was an abundant supply of plants, it was impossible to plant the whole area intended for tobacco. About three arpents were cut off.

The drought of early June was accompanied by such violent winds that, in spite of abundant watering at planting time, the plants established themselves with great difficulty, and certain parts had to be entirely replanted several times. Watering had to be continued, a tedious and costly process and one beyond the means of the average grower.

The harvest was a normal one, and ripening took place in good time although the tobaccos did not have the characteristics of a crop ripened under more favourable conditions.

The placing of the tobacco on the racks, and its drying in the open field without letting the tobacco lie on the ground, was carried on on a larger scale than at St. Jacques.

The drying racks were covered at night and on rainy days. By this means the yellowing of the tobacco was effected more rapidly and without risks. This with the use of charcoal stoves in the curing shed, reduced the drying period materially.

Systematic experiment with chemical fertilizers has tended to verify the formula already recommended to the tobacco growers of Quebec.

STATION AT HARROW, ONT.

The plantations were made during a showery and rather cool time. This aided the plants in establishing themselves, but was also favourable to the cutworms, which were especially troublesome.

The soil in the seed-beds was treated with steam. The results were more marked and more favourable than were those obtained by using formalin.

Among the varieties of tobacco grown at Harrow in 1914 were several types of burley, recently obtained from Kentucky. Many of these were interesting and some proved superior to the type of "Improved White Burley" grown at Harrow for some five years, and coming originally from the Experiment Station at Lexington, Ky.

Among the yellow, flue-cured tobaccos, the "Yellow Prior" and "White Stem Orinoco" are noted for their adaptability to the climate of Ontario, and furnish a product of good colour. Some of the Italian varieties give a good proportion of clear yellow leaves, but their texture is somewhat weak.

As at Farnham, systematic experiment with chemical fertilizers is being carried on at Harrow. Although some deductions may be drawn by the reader from the results obtained in 1914, nothing conclusive can be stated from only one year's work.

The same system of harvesting practised at St. Jacques and at Farnham was introduced at Harrow in 1914. The results will be more easily judged in an autumn more favourable for the drying process, this period in 1914 being marked by a prolonged spell of damp weather which caused mould to appear in some curing sheds.

INSPECTION.

This work was carried on mainly in eastern Ontario, the inspector for Quebec having been called to the French colours in August. The Ontario inspector besides his special work, supervised the experiments carried on at Walkerville in the use of acid fertilizers to prevent the damage done by tobacco root rot.

EXPERIMENTAL STATION FOR PRINCE EDWARD ISLAND, CHARLOTTETOWN, P.E.I.

THE SEASON.

The snowfall during the winter of 1913-14 was heavy and gave good protection to shrubs and plants during the very low temperatures of February. The weather remained very backward throughout the whole month of April, and an ice storm occurred on April 21 that broke many shade and fruit trees. Sleighs were in use on the roads after the storm on May 2, but the cold dull weather cleared up after another heavy snowfall on May 11, and the weather for the remainder of the month was favourable for work and plant growth. Seeding began May 18 and became general on the 22nd, about one week later than usual. The trees appeared green May 28. During June, rain occurred on seventeen days, and vegetation remained backward owing to the cold nights, the excessive moisture, and the absence of any really hot days. Seeding was completed by June 20. The first part of July was cool. The hay crop thickened up splendidly, and cutting began on July 15. The crop was heavy, and less than one-half had been saved at the close of the month owing to unfavourable weather. The crops grew well during the favourable weather of August. The second week was hot, being splendid for haymaking, which was completed about the middle of the month. The first grain harvested at this Station was Daubeney oats, which were cut on August 20. Harvesting became general about September 1. During the first and fourth weeks of September the hottest weather of the season occurred. The greatest harvest for a number of years was almost all saved during this month in good condition. October and November were exceedingly fine, fall ploughing being delayed owing to lack of moisture in the soil. Fall tillage operations, however, were well completed before winter set in. December came in so mild that ploughing was continued up to the 5th. Winter began in earnest on the 22nd, with heavy gales and snow which were followed by unusually low temperatures at Christmas, the thermometer dropping to —10·1° F. on three different days, and the winter ice-breaking steamers were obliged to go on the Georgetown-Pictou route on December 24. The balance of the winter was very mild, with the exception of one cold week about the first of February. Carriages were used more than sleighs during each of the winter months.

METEOROLOGICAL RECORDS.

Months.	Temperature Fahr.					Precipitation.					Bright Sunshine.
	Maximum.		Minimum.		Mean.	Rainfall.		Snowfall.		Total.	
	Date.	Deg.	Date.	Deg.	Deg.	Days	Ins.	Days	Ins.	Ins.	Hours.
1914.											
April	28	56	3	8	32·6	6	1·33	6	24·5	3·78	194·9
May	21	76	1	26	48·548	8	1·2	2	8·5	2·05	191·4
June	24	79	3	34·5	54·741	17	5·32			5·32	247·7
July	17	82	2	37	63·201	8	2·84			2·84	277·9
August	11	84	25	46	64·	15	2·43			2·43	247·9
September	23	87	29	35	59·016	12	5·02			5·02	191·
October	5	72	7	26	47·823	16	3·57			3·57	135·9
November	2	59	19	11	35·234	9	2·29	4	3·6	2·65	96·5
December	1	50	25	−10	22·709	4	1·1	7	9·2	2·02	99·9
1915											
January	20	48	31	−14	21·58	6	2·62	11	27·	5·32	72·4
February	7	49	2	−13	22·624	10	1·54	3	8	2·34	94·6
March	26	45	27	10	25·774			18	23·5	2·35	86·4
Total annual						111	29·26	51	104·3	39·69	1,936·5

BUILDINGS.

The old coach-house was remodeled, with a veranda built across the south end and along the east side. This and a comfortable cloak and toilet room for ladies who come to the Station on picnic excursions were much needed for our visitors. A stove, sink, and drip-board, with plumbing connections, were placed in a lunch room for the men, and were found very convenient in connection with serving hot tea and coffee to the Farmers' Institute excursions.

Two colony houses and a few small rearing-houses were added to the equipment of the poultry yards. A bee supply house was fitted up near the apiary.

UNDERDRAINAGE.

The work in underdrainage was begun as early in the spring as the frost would permit, and the greater part of the wet or late areas of land on the farm were drained before planting. The balance of this work was completed in the early autumn. Some $6\frac{1}{4}$ miles of tile were laid during the season, draining about 28 acres.

HORSES.

The six horses at the Station are in good condition for the spring work. A team of pure-bred Clydesdale mares were purchased in the spring of 1914. One of the mares, "Darling of Taunton," No. 18507, is now carrying a foal by "Baron Kelvin."

DAIRY COW.

The milk cow, "Plum," calved in June and, after recovering from an attack of milk fever, produced 6,646 pounds of milk in ten months. Her profits over the year's feeding expenses were $63.09. She was milking well at the close of the fiscal year, when she was sold to make room for two pure-bred Ayrshire cows, "Island Queen of Spruce Row" and "Lady Petunia of Spruce Row." These promising young cows are the beginning of an Ayrshire herd for this Station.

STEERS.

The steer-feeding experiments were continued with three pens of four steers each. Good feeders of a beef type are not plentiful in this province, and the steers fed had more or less of dairy blood in them. The following prices, live weight, were obtained at auction, according to quality: four good steers, $7\frac{3}{4}$ cents per pound; four medium steers, average price $7\frac{1}{2}$ cents; four light dairy steers averaged $6\frac{3}{4}$ cents per pound. The cattle were fed at a good profit. Details will be found in the Animal Husbandry section of the report.

SHEEP.

The small Leicester flock of sheep gave a good crop of lambs in the spring of 1914. This flock was found to be badly infested with internal parasites. Treatment for these is still being continued.

LAMBS.

The lamb-fattening experiment with different roughages was continued, and a good margin of profit realized from the better rations.

POULTRY AND BEES.

These two lines of work were under the care of one man. The poultry plant was enlarged and the flocks of Barred Plymouth Rocks and White Leghorns were increased. Experimental work with cotton-front colony houses and straw-loft houses showed the

cotton front type of house to be satisfactory. The houses with straw lofts were drier under all weather conditions than those without.

The bees produced a fair amount of honey, and the five colonies increased to nine. An experiment with out-door *versus* cellar wintering was tried, four colonies being left in a sheltered location outside. A spring examination revealed two colonies dead in the bee cellar and also two dead in the outside wintering case, although all had an abundant store of honey.

CEREALS.

The season was favourable, and large crops of cereals were harvested in good condition. Co-operative work with three varieties of oats was continued with a number of farmers. At the end of the third season's work, Banner oats maintains a good lead over the other varieties tested.

FARMERS' PICNICS, VISITORS.

The Farmers' Institute picnics were increasingly popular, and many farmers visited the Station in this way during the season, when they could see for themselves what was being done in experimental and demonstration work. Educational addresses and agricultural lectures, were given at these picnics by the leading men of the province, and were greatly appreciated by the excursionists. The number of visitors recorded during the year was 5,296.

EXHIBITIONS.

With the assistance rendered from Ottawa, an exceedingly fine exhibit was put up in the most central part of the exhibition building at Charlottetown during the Provincial Exhibition, September 22 to September 25, 1914. This exhibit attracted much attention and received very favourable comment. An interesting display of flowers, fruit and honey was made at the second annual flower show held in August, 1914. The superintendent judged at several of the county exhibitions.

CONVENTIONS AND ASSOCIATIONS.

The superintendent was present and took part in the discussions at the various conventions and association meetings in the province, and in connection with the Maritime Winter Fair at Amherst, N.S. He gave an address on the "Improvement of Seed Grain in Prince Edward Island" at a meeting of the Canadian Seed Growers' Association for Nova Scotia during the short course at Truro, N. S.

SHORT COURSES AND AGRICULTURAL MEETINGS

The superintendent gave instruction in field husbandry at the Prince Edward Island short course in agriculture held at Charlottetown during January, 1915, and in floriculture at a number of the short courses in household science held during January and February, 1915. Instruction was also given in field husbandry at the agricultural short course held in Shubenacadie, N.S., February 8, 9, 10, 1915.

Farmer's Institute and Women's Institute meetings were addressed at various times in different parts of the province, and a series of meetings were addressed in the Musquodoboit and Stewiacke valleys in Nova Scotia during February, and another series of meetings were held along the Canada Eastern railway at Doaktown, Blackville, and Millerton in New Brunswick during March, 1915.

SALE OF SEED GRAIN AND DISTRIBUTION OF SEED POTATOES.

Ten lots of registered Banner oats of the second generation, one lot of registered Red Fife wheat, and three lots of Manchurian barley were sold to farmers. Twenty samples of potatoes were sent out in April, 1914.

A considerable quantity of first generation registered Banner oats and Marquis wheat has been sealed by the inspector, and will be sold to prospective members of the Canadian Seed Grain Growers' association, in the spring of 1915.

EXPERIMENTAL FARM, NAPPAN, N.S.

SEASONAL NOTES.

During the winter of 1913-14, a most satisfactory covering of snow remained on the ground, from the 25th of December to the second week in March. During the latter part of March and the first of April, however, heavy thawing and freezing occurred; this helped reduce the hay crop since practically all the clover was winter-killed. April was unsettled throughout. May gave promise of being a favourable month, but a change took place toward the latter part with the result that June came in with very unseasonable weather, light flurries of snow, and low temperatures.

Notwithstanding this, however, all grain was sown during the occasional fine days of the last week in May and the first week in June. The weather continued cool during the remaining part of the month, but germination took place much more rapidly this year than last. The grain was only seven days in showing above the ground, whereas last season it was from eighteen to twenty. Neither corn nor grain made much growth until the latter part of July, then both came on very rapidly. July and August were undoubtedly the best growing months, but fruits and vegetables did not do very well. Very favourable conditions maintained until the latter part of September, from which time dull, cold weather prevailed until the end of the season, with an occasional fine day. Up to October 16, weather conditions were most favourable for harvesting, but a cold spell was experienced after that date, causing some delay. All fruit was harvested in good condition.

Quite heavy frosts were recorded during the early part of October. Only fair progress could be made in the fall ploughing, since much of the land was too wet. The total precipitation for the month was 2·46 inches. Cold, wet weather prevailed throughout the first three weeks in November. The remaining part was fine and mild. The total precipitation for this month was 2·97 inches. The weather was rather unsettled during December. The first two weeks were fairly fine, with occasional snow flurries. Fairly heavy showers, with low temperatures, characterized the latter part.

It may be said that it was a very open fall with considerable rainfall followed by a very open winter with much mild weather during the latter part.

SOME WEATHER OBSERVATIONS taken at Nappan Experimental Farm, 1914-15.

Month.	Temperature, Fahr.			Precipitation.			Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	
	°	°	°	Inches.	Inches.	Inches.	Hours.
1914							
April	61	8	33·94	1·89	18·00	3·69	172·05
May	79	24	49·03	·75	.....	·75	147·10
June	77	26	54·19	4·23	.....	4·23	243·50
July	84	35	61·54	3·61	.....	3·61	255·00
August	84	40	62·84	2·95	.....	2·95	210·80
September	84	33	56·25	3·05	.....	3·05	161·75
October	69	20	47·02	2·46	.....	2·46	139·35
November	60	7	33·59	2·97	.....	2·97	85·75
December	51	−17	20·22	1·46	.....	1·46	110·15
1915							
January	53	−10	21·61	2·69	4·00	3·09	75·10
February	54	−14	23·64	1·01	3·00	1·31	94·70
March	48	9	26·35	....	12·00	1·20	75·00
Total for year	....	....	....	27·07	37·00	30·77	1770·25

BUILDINGS.

The herdsman's house was moved up on the hill just east of the main barn, a much more suitable location than the old one. This house was too small and in poor shape, hence it was repaired throughout and an addition built on to the east side, 18 by 22 feet, and fitted up with bathroom and w.c. complete.

The implement shed, located south of the horse stable, was repaired and moved back some 25 feet and east 60 feet. The carriage shed, which stood just east of the Superintendent's house, was repaired and moved down and joined on to the west end of the implement shed. A number of internal changes were made in this carriage shed.

The ice-house, which formerly stood just north of the carriage house, was moved to the corner of the field east of the main barns.

One incubator and feed house, 18 by 26 feet, was erected, also one permanent poultry house 16 by 32 feet, and one brooder house 12 by 14 feet. For further details of new buildings see poultry report for Experimental Farm, Nappan.

ELECTRIC LIGHT SYSTEM.

A complete electric light system has been installed during the past season, with an all-day service.

FENCING.

Some three acres were fenced in for poultry runs. Turned cedar posts set at a distance of one rod apart, were used, with electric weld poultry wire for the main run. Smaller runs for breeding stock were built in front of the houses, but Page poultry wire was used instead of electric weld, which will give a test as to which will be more suitable. All fences were gone over in the spring and given general repairs.

CLEARING LAND.

Some 16 acres of land were cleared and broken during the summer at a cost of $24.20 per acre. The plough called the "Manitoba Brush Breaker" was used and proved to be an excellent plough for the work, four horses being used on it.

ROADMAKING.

The split-log drag was put over the main road, east and west of this Farm, several times during the early part of the season. The road machine was also used on a short section of it. In this way it is hoped to encourage the up-keep of the public roads. All the main drive roads on the Farm were gone over several times and dressed up, thus preventing the growth of weeds.

LIVE STOCK.

A most successful year can be reported from this Farm in all experimental work with live stock.

The experiment of grading up a bunch of common dairy cows of this district, by the use of pure-bred sires, started in 1911, was continued. The results obtained up to date are most encouraging, as a large percentage of the progeny are giving every evidence of being superior to their dams. (See table of production under division of dairying.)

A similar beef feeding experiment to that conducted the two previous years was again carried on, and most satisfactory results obtained. Twenty-four steers were divided into two main groups, according to fleshing and type, into good butchers and good stockers. These were subdivided into heavy-fed and light-fed groups, each of these in turn was further subdivided into lots fed different rations. The profit per steer ranged from $12 on the smaller to $23 on the larger ones.

The experiment in feeding lambs was of the same nature as that for 1913-14, but instead of clover hay, broadleaf was used. Fifty grade wethers were purchased for this test. These were divided into four lots and fed on different rations. Lots 1 and 2 received timothy hay and meal. Lots 3 and 4 received half broadleaf and half timothy hay and meal. Lots 2 and 4 received roots in addition to the meal ration. The profits per lamb were as follows: Lot 1, $0.64; lot 2, $0.63; lot 3, $0.36; and lot 4, $0.29; showing the superiority of timothy hay over broadleaf hay in feeding lambs.

A very successful year can be reported in breeding swine. Some thirty-three pure-bred pigs were sold during the season, and three young sows kept to increase the herd.

The pure-bred Shropshire flock started in 1912, has given very satisfactory returns during the winter of 1914-15. The yield was nine lusty lambs from eight ewes.

CEREALS, ETC.

Eleven varieties of wheat were tested and ranged in yield from 26 to 46 bushels per acre; twelve varieties of oats ran from 81 to 100 bushels per acre; six varieties of two-row barley ranged from 30 to 60 bushels per acre; six varieties of six-row barley ranged from 27 to 57 bushels per acre.

The buckwheat plots did not do as well as they should have, being grown between two rows of large apple trees. Five varieties were sown, with yields from 30 to 38 bushels.

Peas were badly infected with blight, hence the crop was not worth reporting.

Nine varieties of ensilage corn were sown, and ranged in yield from 7 to 18 tons per acre.

Sugar beets yielded very satisfactorily, four varieties being tested, giving a yield of from 9 tons 200 pounds to 9 tons 1,200 pounds per acre; thirteen varieties of turnips gave yields from 20 to 27 tons per acre; eleven sorts of mangels from 9 to 20 tons per acre. The six varieties of carrots gave from 11 to 19 tons per acre.

Some sixteen varieties of potatoes grew very well, nothwithstanding the fact that the soil was not as friable as it might have been. The yields were from 135 bushels 42 pounds to 333 bushels 18 pounds per acre.

The quality of the large fruit was such as to compensate for the low-yield; more especially is this true of the apples. The commercial orchard made very satisfactory growth during the year. Careful data are being kept of the returns of this orchard in order to demonstrate the actual cost of bringing it into profitable bearing.

Small fruits gave very meagre returns. The location of this plantation is undesirable, and is now being changed. Strawberries were injured to some extent by the severe freezing and thawing during the winter of 1913-14, consequently winter-killing was much in evidence.

An experiment with spray mixtures was carried on as follows: Lime-sulphur and Black Leaf 40 *versus* lime-sulphur and lead arsenate, also lime-sulphur *versus* Bordeaux mixture. The best results were obtained from the use of lime-sulphur and Black Leaf 40, also from lime-sulphur over Bordeaux. (For further detail see horticultural report.)

All flowers at this Farm did exceptionally well, considering the late spring and cool summer.

An exhibit of farm produce was made at Shubenacadie on September 23 to 25, Kentville, October 6, 7, 8, and 9; and at the Maritime Winter Fair from December 7 to 10.

MEETINGS ATTENDED AND ADDRESSES GIVEN.

During the year the Superintendent gave addresses at a series of meetings on "Patriotism and Production," held at Port Elgin, N.B., Sackville, N.B., Rexton, N.B., Petitcodiac, N.B., Doaktown, N.B., Millerton, N.B. and Blackville, N.B.; attended the Farmers' and Dairymen's convention at Fredericton, and gave an address on beef cattle; judged the school gardens for Salem, West Leicester, East Leicester, Mansfield, and Little River schools, giving them a talk on school gardens; also attended the conference of officials and superintendents held at Ottawa from January 14 to 20, 1915.

There were six picnics held at this Farm during the summer months. The number of visitors recorded during the year was 2,652.

EXPERIMENTAL STATION, KENTVILLE, N.S.

THE SEASON.

The temperature during the latter part of April and the first part of May was fairly uniform, with no warm periods to force growth, with the result that plants made little growth until after the middle of May. The mean average temperature for the period from the middle of April to May 1 was 41·2 degrees, and for the following two weeks ending May 15, 43·4 degrees. The mean average from May 15 to June 1 was 57·5 degrees. The spring was a normal one in that, as a general thing, good growing weather does not start until about the middle of May. There were 9, 4, 3, 2 and 1 degrees of frost on the 1st, 2nd, 12th, 16th, and 17th of May, respectively. On the 4th of June there was a severe frost in parts of the valley which did much damage to fruit trees in bloom. Frost was noticeable at this time at the Station; the thermometer registered just 32 degrees, but it was not heavy enough to do damage.

The first part of May was dull, with no good drying winds, and as a result spring work was late. The first seeding was done May 20. Crops generally came on rapidly during the latter part of May and June, except corn which, owing to a cool June, made slow growth. In some places early seeded corn just through the ground was killed by the June 4 frost. The rainfall during June was 4·2 inches, but this was followed by a dry July, for which month only 1·45 inches fell. Crops did not suffer as

much as might have been expected, due largely to an absence of prolonged hot, drying winds. August and September were, on the whole, favourable months, and corn and roots made fair growth. The fruit crop was not heavy, especially in sections hit by the June frost. The fruit as a general thing was well sprayed and packed out good in quality. The first fall frost of 5 degrees which damaged corn not cut, came October 1. Weather was favourable for the fruit crop harvest and it was completed before heavy fall frosts.

November was a good month for finishing up fall work, and ploughing was possible, except for a short period, during the whole month. There was little bright sunshine during the first half of the month; the total rainfall, however, was light and in some cases a shortage of water in wells was reported. The first week in December was open, and ploughing was possible on the 5th. There was a fall of snow on the 23rd of 8·02 inches, which made good sleighing for Christmas. The thermometer registered 6, 4 and 5 degrees below zero on the 25th, 26th and 27th, respectively.

January was unusually mild, with the lowest 1, 4, and 4 degrees below zero on the 5th, 30th, and 31st, respectively. There were three heavy thaws during the month, and rain fell on twelve days. Much damage was done to the fields from washing, and in many cases deep gullies were cut out by the water. There was good sleighing only from the 21st to the 23rd, and although 21·12 inches of snow fell, this was followed by mild weather which soon melted it. February was also mild after the first week, and there was little snow except from the 1st to the 6th to make sleighing, and as a result, lumbering and getting out wood were seriously hampered. There was little rain during the month, and although the temperatures for Feb. 2, 3, 4 and 5, were 9, 4, 2, 1 degrees below zero, Fahr., after that time the temperature did not go below 10 degrees above zero, which was very unusual. March was an even month with not enough snow at any one time for sleighing, and no rain fell during the month, with the result that the usual flooding from spring rains did not occur.

METEOROLOGICAL RECORDS.

WEATHER OBSERVATIONS taken at Experimental Station, Kentville, for 1914.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	
1914.	°	°	°	Inches.	inches.	inches.	hours.
April	36·8	72	16	1.48	8.5	2.33	196.
May	50·72	84	23	1.26	2.0	1.46	189.6
June	56·2	82	32	4.2	....	4.2	250.3
July	62·88	85	39	1.45	....	1.45	238.9
August	63·	87	40	2.58	....	2.58	211.1
September	57·6	88	35	3.65	....	3.65	173.8
October	49·5	70	25	1.90	....	1.90	158.2
November	36·4	65	5	3.09	1.0	3.19	109.7
December	22·89	56	6	1.57	10.18	2.58	85·1
1915							
January	22·83	56	4	2.64	21.12	4.75	73·4
February	25·61	54	9	0.63	6.25	1.25	99·6
March	26·81	50	9		9.5	0.95	103·1
Total				24.45	68.55	30.29	1888·6

CROPS GROWN.

Seventeen acres of oats sown on newly cleared land produced an average of 47 bushels per acre. The total area in oats, including the different fertilizer plots, was 31½ acres. Twenty-two acres of this was seeded to clover and timothy, which started well and gives promise of a good crop for next year. Ten acres were planted to potatoes, of which 5 acres was poor land without fertilizer to find out the uniformity of the land for future experimental work. The crop on this was light and small and most of it was fed to the stock. Three acres were also in fertilizer tests and averaged 64½ bushels of oats per acre. A block of one-half acre of Delaware yielded 142 bushels per acre, and one-half acre Empire State, 137 bushels potatoes per acre. Four acres of turnips sown early in June yielded 680 bushels per acre, and 1 acre seeded July 4 yielded 490 bushels per acre. The total turnip crop was 3,013 bushels. Ten acres of corn yielded an average of 12 tons per acre, 120 tons of ensilage corn fairly well matured was put into the silo. The area in hay was very limited, and 16½ tons only were secured. One acre of winter rye was cut for green feed for stock. An acre was seeded to alfalfa, which has made a fair start.

FRUITS PLANTED.

Additional plantings have been made of orchard fruits, and the area now in orchard is 42 acres, comprising 1,068 apple, 259 pear, 175 cherry, 398 plum, 102 peach, and 25 quince and apricot trees, or a total of 2,027 trees. Four thousand strawberry plants were set, also a number of new sorts for experimental purposes. The bush and cane fruits have made good growth and should give good crops next season.

LAWNS, SHRUBS AND TREES.

The lawns suffered very much during the summer from lack of rain. The land is light and poor, and will have to be fertilized to get a good lawn. The shrubs and ornamental trees have made a fair start.

FENCING.

Fifty-four hundred feet of fence were erected to inclose the ravine in order to use it for pasturage. Parts of this were difficult to construct, it being necessary to clear and stump the area through which the fence was built. Cedar posts were set one rod apart, and plain wire was used.

DRAINAGE.

Two thousand feet of underdrains were put in on an area to be used for permanent fertilizer plots.

ROADS.

In order to avoid fencing along the main road to the rear of the farm, a road for stock was cleared along the west edge of the ravine. An area 30 feet wide and 2,850 long was cut, stumped and ploughed.

CLEARING LAND.

Twenty acres of land were cleared of stumps and brought under the plough. This area, for the most part, had been in hardwood, and many of the stumps were large and much expense was involved in getting the land in condition for crops. It will be necessary to use 15 acres of this land for corn next year. A 7-acre block cost $226.79 per acre to clear, and the balance cost $256.89 per acre.

OVERFLOW WATER.

The fields at the front of the Farm incline abruptly toward the north and, with a heavy rain, serious flooding and washing of the lower areas result. Stone drains constructed to carry the surplus water away were washed out, and much damage done to the main drive road. Catch basins with large pipe to carry the water were filled with sand, making it necessary to dig the pipe up to clean out the obstruction. On the whole, the taking care of the surplus water during heavy fall or spring rains is a rather difficult problem.

EXPERIMENTAL ORCHARDS.

Experimental orchard work at Falmouth, Hants county, N.S., Berwick, Kings county, N.S., and Bridgetown, Annapolis county, N.S., was continued this season. Much information of value to the growers is being obtained in these orchards. The work at Falmouth and Berwick was conducted by Mr. Arthur Kelsall, and at Bridgetown by Mr. M. P. Pike.

FERTILIZER EXPERIMENTS.

A number of fertilizer experiments have been conducted during the year, and information of value to those who use commercial fertilizers has been secured.

CEREAL PLOTS.

The area suitable for cereal plots is limited, and cereal work was confined to two varieties each of oats, barley, and wheat in plots of one-half acre each.

ROOTS AND CORN.

Tests were conducted with some of the better known varieties of roots and corn. Longfellow seems to be the most suitable silage corn.

VEGETABLES.

Tests were conducted with the leading varieties of vegetables.

FLOWERING PLANTS.

The grounds were made particularly attractive by a free use of annual and perennial flowering plants, which were much enjoyed by visitors. The sweet peas were exceptionally good.

APIARY.

The apiary was increased somewhat during the season. The year was not favourable for a large crop of honey, and only a small quantity was extracted.

POULTRY.

The poultry work has been extended and a new house erected for 100 hens; this, in addition to the seven colony houses, gives housing room for 250 laying hens. A brooder house has also been built. A house 18 by 25 feet formerly used for poultry has been changed into a service and incubator building. A cellar was built and the building moved on to it. The incubation last year was carried on in the root cellar and the results were not altogether satisfactory.

LIVE STOCK.

Three pairs of working horses and one driver have been in use, and in addition three pairs of working oxen have been employed in breaking up land, for which work

they are much better suited than horses. The registered Shorthorn stock consists of seven milch cows, four yearling heifers, three heifer calves, five bull calves, and one herd bull, making a total of twenty head. One Shorthorn bull was sold during the year. Thirty-two head of steers were fed during the winter; these were a little light for profitable feeding, and the gains on them were not great. The most of the feeds consumed by the stock has to be bought and, owing to the high price of hay and meals the margin was small.

MEETINGS ATTENDED.

Agricultural meetings were addressed at: Amherst, N.S.; Truro, N.S.; Hopewell Hill, N.B.; Hillsboro, N.B.; Salisbury, N.B.; Woodville, N.S.; Falmouth, N.S.; Mt. Denson, N.S.; Gaspereaux, N.S.; Aylesford, N.S.; Somerset, N.S.; Sussex, N.B.; Hampton, N.B.; Rexton, N.B.; Sackville, N.B.; Port Elgin, N.B.; Kentville, N.S.; Fredericton, N.B.; Grand Pré, N.S.

The meetings of the Maine State Pomological Society were attended and addresses given. The Charlottetown, P.E.I. floral show was attended in the capacity of judge, and a meeting addressed there.

BUILDINGS CONSTRUCTED.

In addition to the poultry buildings mentioned above, an implement and tool building was erected. This building is 96 feet long and 30 feet wide, with 12-foot posts and a store-room above. A steer barn with a capacity of twenty-four head, was also erected with silo and root-house attached. This building is 50 by 22 feet, with wing 12 by 12 feet for feed room and root cellar.

EXHIBITIONS.

An exhibit was put up of produce grown at Kentville, at Shubenacadie, Hants County, N.S., and Kentville, N.S. At the Kentville exhibition, in addition to the general exhibit, a display was made of the vegetables grown at this Station, and also of fruit from the experimental orchard plots illustrating the importance of different sprays.

ASSISTANTS WHO HAVE JOINED THE FORCES FOR ACTIVE SERVICE.

The station at Kentville has lost the services of Mr. J. M. Robinson, B.S.A., assistant to the Superintendent, who gave up his work in September and joined the 2nd contingent for overseas service. Mr. James Gallagher, who was gardener at the station, also at the same time joined the 2nd contingent. Mr. C. Eric Boulden, who formerly had charge of the poultry, Mr. Arthur Kelsall, who had charge of experimental orchard work, and Mr. John Brown, who was employed in horticultural work, have joined later contingents. It is needless to say that these men have been missed in carrying on the work of the Kentville Station, where they have each given highly satisfactory service.

EXPERIMENTAL STATION, FREDERICTON, N.B.

WEATHER CONDITIONS.

The winter was colder than the average, with spells of intense cold almost unprecedented. The average mean temperature for January, February, and March was 15·5 degrees against an average for the last forty years for these months of 18 degrees. There was, however, beginning December 24, a nice even blanket of snow, and frost did not penetrate as deeply as in more open winters. The snowfall was not above the average on the whole, and covered the ground till April 10. April was a cold, backward month with a below-zero record of 3·5 degrees on the 5th; cold high winds were

Field ready for Stumping, Kentville, N.S., May 1915.

Stumps and brush piled for burning. Kentville, N.S., 1915.

frequent, and the precipitation, 4·54 inches, was nearly twice the average for the month. May continued cold and windy, with a minimum record on the 1st of 24 degrees, and frost on May 2, 5, 7, 8, 12, 13, and 29; there were, however, some warm days, since the thermometer reached 89 degrees on the 26th. There was only one-third of the normal precipitation in May, and conditions were most favourable for cultivation. Vegetation was very backward, and cold weather continued through June and up till July 22, when 44 degrees were recorded. All crops consequently made slow growth till almost August 1, and at that date such crops as corn and tomatoes were particularly unpromising. The precipitation, though not quite up to the average, was ample for the Station land and for most soils in the province, and when continued warm weather came in August and September, growth was most satisfactory, and crops eventually were very good. The average mean temperature for August, September, and October was 3 degrees higher than the average temperature for the last forty years. Harvest weather was ideal. Hay and grain were housed in splendid condition, and fine weather continued into November, so that root crops as well as others were taken from the fields in the best possible condition.

Record of Temperature, Precipitation and Sunshine at Fredericton for the year 1914.

Months.	Temperatures. Highest.	Temperatures. Lowest.	Mean.	Precipitation.	Hours of Bright Sunshine.
1914	°	°	°	Inches.	
April	64	−3·5	33·6	4·54	200·9
May	89·5	24	54·9	1·095	189
June	88·5	28	58·2	4·34	262
July	88·5	40	65·2	2·595	260·5
August	85	39·5	64·8	3·73	205
September	89·5	30	59	2·78	186·8
October	77·5	12	47·7	2·775	129·71
November	57	3	30·58	2·75	98·4
December	47	−22·5	17·19	2·03	133·45
1915					
January	50·5	−28	18·83	2·71	85·8
February	46·5	−20·5	21·75	2·47	107·9
March	47·5	6·5	27·9	·62	121·35
Total				32·435	1980·81

BUILDINGS.

During the year a double cottage, two permanent poultry houses of 100-bird capacity each, and a poultry administration building with incubator basement and a brooder house were erected, and repairs made to one of the houses on the Station. As the well drilled in 1913 did not give sufficient flow for all purposes, a new well was started; unfortunately the well-boring machinery caught fire and was destroyed, burning also the coal shed and pumping station immediately adjacent. This accident necessitated a new engine for the old well, and the erection of a temporary shelter. At a depth of 900 feet no satisfactory flow of water has been found in the new well.

FENCING AND DRAINING.

Three and two-third miles of woven wire fence were erected, and preparation made for a continuation of this work.

A crew was kept steadily at work digging ditches and laying tiles. Approximately 23,000 tiles were laid, of which three-fourths were made of concrete. These are being compared with clay tile. So far as ease of handling and loss from breakage are concerned, they have thus far been more satisfactory. The drains laid in 1913 have given great satisfaction, permitting the working of the land three weeks earlier than in the years before the drainage was done.

CLEARING LAND.

Approximately 63 acres was stumped and ploughed during the season. Four and three-quarters acres of this was sown in oats, 2 acres of it planted in orchard, and 7 acres sown to buckwheat. The balance was ploughed after the seeding season, and will be put in crop in 1915. Bushes were cut and burned over 30 acres, and 20 acres of woodland was cut over and the wood sold.

ROADMAKING AND GRADING.

Twenty-five rods of the highway along the river bank was gravelled with beach gravel after several low spots had been stone-filled, and 475 loads of earth were taken off the sides of the farm road to give surface drainage from the farmyard, the earth being used to make an embankment leading to the approach to the dairy barn. The surface of the farmyard was also graded to give an even slope and surface drainage from the barns. Considerable grading on the farm road remains to be done.

LIVE STOCK.

A pure-bred Clyde mare, a grade Clyde mare, and two Percheron grade mares had foals sired by pure-bred Clyde and Percheron stallions, respectively. The pure-bred Clyde foal died from pneumonia four days after birth, and one of the Percheron foals died at three months of age from the same cause. The two remaining colts have made fairly good growth, the Clyde colt weighing on March 31, at eleven months, 860 pounds at a food cost of $32.17, and the Percheron filly weighing on the same date at ten months and twenty days, 740 pounds at a food cost of $30.26. Sires of these colts weighed 1,700 pounds, dams from 1,450 to 1,750 pounds. Ten mares were bred, but only five proved pregnant. An odd grade Clyde mare was sold and a general-purpose mare bought. The horses on hand at the end of the year were three pure-bred Clyde mares, five grade Clyde mares, two Percheron grade mares, two geldings of draught breeding, a general-purpose mare, a cross-bred standard bred Morgan driving mare, and the two colts above mentioned. Two non-pregnant mares were wintered on oat straw, hay and roots; their health was excellent, but they lost weight. The mare on turnips cost for food $3 per month, and in three months lost 115 pounds in weight; the mare on carrots cost for food $3.60 per month, and in three months lost 90 pounds in weight.

Of the thirty-nine feeding cattle mentioned in the last report, thirty-six steers were sold on May 27, after a feeding period of 141 days, at 6¾ cents and 5¾ cents per pound according to quality. Two cows calved and were added to the dairy herd, and one cow died of blood poisoning.

Eleven heifers of no definite breeding, and typical of the average dairy stock among the farmers remote from towns, were bought for the purpose of testing their production from year to year, breeding them to good, pure-bred dairy bulls, and testing the resulting heifers to the third or fourth generation to ascertain what results can be obtained in increased production by the use solely of dairy-bred bulls. Ayrshires, Dairy Shorthorns, and Holsteins will be the bulls used.

Three small pure-bred herds of Dairy Shorthorns, Ayrshires, and Holsteins were put in and all are breeding. Two pure-bred Ayrshire calves died from pneumonia.

Thirty-six feeding cattle were bought in October, three heifers were sold for the Christmas market, two steers were slaughtered, one because of reaction to tuberculin test and one unthrifty for some undiscovered cause. Of the remaining thirty-one, twenty-five made an average gain per head of 277 pounds in the 136 days, almost exactly 2 pounds per head per day; and six dairy type steers gained 229 pounds in the 136 days, or 1⅝ pounds per head per day.

A calf feeding experiment was started March 1; sixteeen calves divided into four pens of four calves each were fed. Pen 1 was fed on whole milk, pen 2, skim-milk and a meal and oilcake mixture, pen 3, Blatchford's Calf Meal and water, Pen 4, Blatchford's Calf Meal and skim-milk. The gain averaged approximately 50 pounds per head for the month in all pens but No. 3, which was only 27 pounds. The cost per pound of gain on whole milk was 7·7 cents, on skim-milk and meal mixture 2·8 cents, on Blatchford's Calf Meal and skim-milk 5 cents, and on Blatchford's Calf Meal alone 8·3 cents. This experiment will be continued to June 1.

Eighteen young pigs were put in temporary quarters on September 15 at from three to four weeks old to utilize dairy waste and unmarketable potatoes. They dressed 80 pounds on the average December 30, after 3½ months' feeding and at about 4½ months of age.

POULTRY.

The year was started with four small flocks of thirty Barred Plymouth Rocks, thirteen White Wyandottes, twenty-one Rhode Island Reds, and nineteen White Leghorns. The plant consisted of three colony houses, two incubators of 250-egg capacity each and one of 120 eggs, and two out-door brooders. One hundred and nine chicks were successfully incubated and reared in April, and 136 in May. Care was taken to incubate eggs from the best laying hens, and a number of fine birds resulted. During the summer, two permanent houses to accommodate 100 hens each were erected, and later a poultry administration building with incubator cellar. In this was placed a 1,200-egg incubator. A brooder house was later built and a coal-heated brooder installed. During the summer, autumn, and early winter, a number of both old and young birds were sold for breeding purposes and for table use. The winter was entered upon with 296 birds of all kinds; 45 additional pullets were purchased in December, giving 270 hens and pullets in all. These birds laid during January, February, and March, 5,914 eggs, some individual birds making exceedingly good records and some very poor. Care is being taken to select for hatching only well-formed, perfect-shelled eggs from the best laying hens.

APIARY.

On June 9 an apiary was started with five colonies of black bees in eight-frame Langstroth hives. The season was cold and backward, consequently they did not do as well as might be expected in a normal season.

No. 4 hive threw a swarm on July 20, and No. 5 on July 28. These were hived in eight-frame Langstroth hives. On September 9 the queens in these hives were destroyed and a day later imported Italian queens were successfully introduced by the smoke method.

The principal honey plants in this district are alsike, apple, aster, buckwheat, dandelion, fireweed, goldenrod, harebell, and wild raspberry.

The total production of honey for the season was 147 pounds extracted, and 59 sections.

CROPS.

Thirty-five acres of newly cleared land was sown to oats between May 23 and May 30. The yield per acre was from 25¾ acres, 22⅔ bushels; from 4¾ acres, 42 bushels of New Market; and from 4½ acres, 49 bushels Banner. As this land had only been ploughed once it was very rough and uneven in quality, and the seed had to be sown broadcast. A portion of the crop could not be gathered for threshing because of so many small roots on the ground. Weather conditions during June and July were so unfavourable that the crop did not get fairly started until August; no fertilizer of any kind was used.

Buckwheat was sown on 7½ acres of newly cleared land. All conditions were unfavourable to growth, and the yield was only 18 bushels per acre.

Eight acres of turnips yielded at the rate of 940 bushels per acre at a labour cost of 4·98 cents per bushel, and 7,295 roots of the Kangaroo variety were stored for seed production in 1915. Three varieties of sugar beets yielded from 410 to 484 bushels per acre, and five varieties of white carrots from 411 to 725 bushels per acre. Fourteen acres of corn yielded an average of 9 tons per acre of fairly well-eared stalks, and the labour cost of growing the corn and putting it in the silo was $2.94 per ton.

Ten and three-tenths acres of potatoes were grown. Four and one-third acres, on land without fertilizer either with the crop, or for many years previously, yielded 209 bushels per acre. Leaving out land unfertilized, the average yield per acre for the crop was 272 bushels. The surplus of the crop was shipped from the field direct to dealers in Saskatoon.

Hay from old sod, of which there were 40 acres cut over, yielded 1 ton per acre. Ten acres of newly-seeded clover under rather unfavourable conditions gave 1¼ tons per acre. Two small patches of alfalfa were seeded in July. The ground was limed, the seed inoculated, and a good stand secured. Peas and oats were sown for soiling crops on ground full of mustard. The growth of mustard was sprayed three times with bluestone solution, and thus partially kept under. The crop was all cut before any of the mustard could ripen seed.

HORTICULTURE.

Seventeen acres was devoted to horticulture, as follows: Old orchard, 2 acres; new orchard, 11 acres; small fruits, vegetables, flowers, and nursery, 4 acres. Six hundred and six apple, twenty-seven pear, one hundred plum, and sixty-nine cherry trees were set. A large number of varieties of raspberries, currants, gooseberries, strawberries, rhubarb, and grapes were planted, and considerable additions made to the nursery. A perennial border, 560 feet long, was established, and a large variety of roses and annual flowers also grown. Variety and fertilizer tests were made with vegetables, including 152 varieties of potatoes.

Seed plots of leading varieties of potatoes were hill-selected at harvest. The average weight of the largest hills, according to variety, varied from $2\frac{9}{10}$ pounds to 5½ pounds, and that of the small hills from $\frac{9}{10}$ pounds to 3¾ pounds according to variety. Sixty-five hills of "Wee McGregor" potatoes averaging 5½ pounds each in rows 30 inches apart and hills 12 inches apart in the rows yielded at the rate of 1,603 bushels per acre, while 353 hills of the same variety at the same distances averaging 1 pound each, yielded only 290 bushels per acre, evidencing the possibilities of seed selection and intensive cultivation. In the tests of 152 different varieties of potatoes, thirty yielded at the rate of over 400 bushels per acre, the highest being 510 bushels.

FERTILIZER EXPERIMENTS.

Tests as to the relative values of nitrate of soda *versus* fish scrap, and basic slag *versus* acid phosphate were made in the growing of potatoes. Nitrate of soda gave 16 bushels more per acre than fish scrap, and basic slag gave 8 bushels more per acre

than acid phosphate. In using different quantities of the same fertilizer per acre, 500 pounds of a 4-8-10 mixture gave 291 bushels per acre, while 1,000 pounds of the same gave 311 bushels per acre, the gain in yield being only 20 bushels per acre worth, at 40 cents per bushel, $8, while the extra 500 pounds fertilizer cost approximately $10. The check plots on which there was no fertilizer gave 155 bushels per acre.

In testing the amount of potash used per acre it was found that the results were practically the same as last season; 6 per cent potash giving 305 bushels per acre; 10 per cent, 274 bushels; three per cent, 254 bushels; and no fertilizer, 171 bushels. Some striking results were obtained as to the economy of using a combination of fertilizer and light manuring *versus* heavy manuring in the growing of vegetables. In nearly every instance, much money was saved by using 15 tons of manure and a few hundred pounds of soluble fertilizer per acre against 30 tons of manure and no fertilizer.

MEETINGS AND ADDRESSES.

The arrangements for meetings on behalf of "Patriotism and Production" in New Brunswick were placed in the hands of the Superintendent. In this work he had the hearty co-operation of the Provincial Department of Agriculture, the officials of which took charge of the advertising of these meetings and the supplying of some of the speakers. The Superintendent attended and addressed nine of these meetings and attended the meetings of the Farmers' and Dairymen's Association, taking part in some of the discussions. Cattle were furnished for the judging work at the Agricultural School at Woodstock, and horses and cattle provided for the Farmers' and Dairymen's Association judging demonstrations.

Addresses were given at the agricultural school at Woodstock and at the Florenceville Seed Fair.

Visits were made to the Station during the year by the delegates to the New Brunswick Women's Institute Convention at Fredericton, by the members of the Farmers' and Dairymen's Association, and by the members of the New Brunswick legislature.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIERE, QUE.

The winter of 1913-14 was cold and dry, with little snow, which disappeared during the last days of March, although the soil remained frozen until the last of April.

Seeding commenced on May 9, but was not finished until the 31st, owing to rainy weather. During the latter part of June and throughout July extreme drought prevailed; this reduced the hay crops to much below the average yield.

CULTURAL WORK.

Destroying Couch Grass.—An experiment in bare summer-fallowing throughout the season, compared with good cultivation until June and then sowing a smother crop was carried on. The results this year did not favour the use of the smother crop. The bare summer-fallowing destroyed the couch grass only to the same degree as did disc-harrowing in the neighbouring field.

Methods of weed eradiction will continue to receive attention, along with the study of soil cultivation and rotation of crops.

HORSES.

At this Station we have one driving horse and five working teams. Two of these teams were purchased during the summer to meet the increase of work due to the enlargement of the Station.

An experiment in the economical wintering of horses was carried on. These were given light work and were fed on a ration of hay and oat straw. They remained in good health during the winter. They consumed slightly less than 1 pound per day of each of the above feeds per 100 pounds of live weight. The weights of the horses at the beginning and end of the test showed that they lost 2 and 2½ per cent, respectively.

CATTLE.

There are at this Station a good bull and twelve cows, registered Ayrshires, and seven calves of the same kind. There are also six bull calves, which may be sold for breeding purposes.

Six young grade cows were bought in May to carry on an experiment in grading up by the use of a pure-bred bull. These were obtained from the ordinary herds of the districts, and probably represent the average as milk producers. They were chosen for variety of colour and conformation with the view of showing the advantage of continued crossing with a pure-bred sire for improving milk production, and uniformity of colour and conformation.

SWINE.

There are at present on the Station a good Yorkshire boar and two sows of that breed as foundation stock.

BEES.

Thirteen hives wintered well in a dry and well-ventilated cellar. The Station apiary has attracted much attention from visitors who had an opportunity to observe the bees at work in a glass-fronted hive. The honey flow was abundant and of good quality.

EXPERIMENTS WITH CEREALS.

Not yet having land suitable for extensive tests of cereals, the work was confined to trials of the following: Wheat, Marquis and Huron; barley, Success and Manchurian; oats, Ligowo and Daubeney; and the Arthur variety of peas. These were tested in small plots in the young orchard planted in 1910. More extensive trials will be carried on as soon as the land to be used for the purpose can be prepared and drained.

HORTICULTURE.

Four hundred and eighty-six fruit trees were planted in the spring, including 318 apple, 108 plum, 40 cherry, and 19 pear trees. Many of the varieties represented had not previously been tried in this district.

Three hundred and twenty specimens of small fruits were planted in the new orchard. Two hundred and twenty-four varieties of vegetables were tested.

IMPROVEMENTS TO THE STATION.

Considerable work of this nature was done during the year, chiefly by removing stones and putting up fencing, etc. More than 900 rods of wire fencing were put up. The posts were all painted, and those along the road were turned. The stones removed were used for masonry, for paving the barnyard, and for foundation for the farm roads.

Buildings.—An old uninhabitable house was reconstructed so as to furnish two good dwellings, with stone foundations. A house for the farm scales was built.

DRAINAGE.

More than 18,000 feet of tile were laid in the fields, and 600 feet were used to complete the drainage of the barnyard, which was paved with stone and gravel during the summer. The yard is now firm and dry.

An approach to the new barn was also built. The sides of this approach are of stone, 3 feet thick, built on a deep foundation of large rocks and cement.

Cement platforms were built at the main entrances of the cow stable and the horse stable. The above, with the improvements made to the public roads, have done much to improve the appearance of the Station.

EXHIBITIONS.

Exhibits were made at Three Rivers and Quebec, of the products of the Station in fruits, vegetables, honey, etc. At Three Rivers the Station was awarded a diploma for the best exhibit of pure honey, and one for the best exhibit of vegetables. At Quebec a diploma was received for the best exhibit of vegetables, and the gold medal for the best exhibit of fruits and pure honey.

VISITORS.

These numbered 1,936 during the year, besides visits made by the Dairy Commissioner and his officers of this district, also by the professors and students of the Ste. Anne College of Agriculture.

VISITS MADE.

The Superintendent examined forty-six fields in the district, and gave practical demonstrations of cultural methods. He installed the Station exhibits at Three Rivers and Quebec, and judged at the L'Islet County Horticultural Show. He was present at the conference of agricultural missionaries at Ottawa, and later attended the conference of superintendents there. He also assisted the Superintendents at Lennoxville at a series of meetings in the counties of Compton and Wolfe.

METEOROLOGICAL OBSERVATIONS.

Month.	Temperature F.					Precipitation.					Hours of Sunshine.
	Date.	Maximum.	Date.	Minimum.	Mean.	Rainfall.	Snowfall.	Total.	Number of Days. Rain.	Number of Days. Snow.	
1914.		°		°	°	In.	In.	In.			
April	20	61·0	12	6·2	31·3	·54	5½	1·09	5	3	174·6
May	20	80·4	1	22·0	53·4	3·18	1	3·28	13	1	241·4
June	25	81·4	2	32·4	56·8	·92		·92	15	.....	235·6
July	14	91·4	29	37·2	63·6	·64		·64	2	.....	288·2
August	10	89·4	22	34·6	60·0	1·04	.....	1·04	5	.....	238·8
September	21	82·4	30	31·8	50·5	2·34	.....	2·34	7	.....	178·6
October	2	66·2	28	30·0	47·2	3·46	1½	3·61	11	1	112·8
November	30	47·0	19	2·0	24·4	1·19	8	1·99	5	7	80·8
December	2	45·0	24	—24·2	9·6	·24	6½	·89	11	5	103·0
1915.											
January	7	47·3	31	—18·8	16·2	·92	7	1·62	3	5	78·4
February	16	39·5	2	—16·3	17·7	2·38	13	3·68	3	5	81·8
March	25	43·7	8	2·6	22·6	·10	7	·80	1	3	140·8
Total	.....	.....	.....	.....	.....	16·95	49½	21·90	81	30	1·955·0

NOTE.—10 inches of snow are taken as equivalent to 1 inch of rainfall.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

CHARACTER OF SEASON.

Spring was about an average one for earliness. The last frost occurred on May 17, when 29·2° F. was registered. A drought which lasted all through July until August 11 cut down the yield of hay and the stock-carrying capacity of pastures very much; it also hurt carrots, mangels, sugar beets, vegetables, all herbaceous flowering plants, raspberries and strawberries, whilst corn for silage, swedes, fruit trees, gooseberries, currants, ornamental trees and shrubs did not suffer. Early sown grain pulled through very well. The first frost was on September 29, when the thermometer went down to 27·2° F.,; this was fourteen days later than in 1913. The lowest temperature was on February 11,—30·7° F., and the highest, exactly six months later, on August 11, 92° F.

LIVE STOCK.

All the live stock kept in good condition during the year.

HORSES.

At the beginning of the year, there were nineteen horses: fourteen registered French Canadians—nine mares, two 2-year-old fillies, one yearling stallion, two weanlings—also two teams of from 2,600 to 2,900 pounds and one driver. These horses are kept for work, experimental feeding, experimental housing, and to sell high-class breeders at a reasonable figure.

Work.—During the twelve months each horse averaged over 200 full days' work of ten hours.

Experimental feeding—Wintering an idle horse at low cost—By feeding 1 pound each of rough hay, oat straw, and roots per hundred pounds live weight, an 11-year-old mare, weighing 1,055 pounds on November 1, 1914, was kept for $13.64 until March 31, 1915, when she tipped the scales at 1,100 pounds. This experiment has now been made four years in succession, and the average cost, for 151 days, has been $14.33, with a gain in weight of 37 pounds for each horse.

Cost of raising horses.—All the feed given to a young stallion, from the time he was weaned until he was 22 months old was weighed and amounted to $90.69, at the following valuations: hay, $7 per ton; oats, 1½ cent per pound; bran, 1 cent per pound; pasture $1 per month. The average weight of the sire and dam of this colt is 1,075. and this is exactly what the youngster weighed at 22 months, which shows that, when matured, he will probably tip the scales at 150 to 200 pounds more than his parents. Two weanlings were kept until the March 31 following their birth for 18 cents each per day.

Experimental housing.—During the last three winters, five different colts have been kept outside, with only a single-board shed for a shelter, and the temperature went down as low as —31° F. They never even shivered, and though it may have taken more food to keep up the necessary warmth, they have kept in splendid health.

CATTLE.

The herd now comprises twenty-nine head of pure-bred and ten grade French Canadians: four bulls aged 8 months to 6 years, eighteen cows, thirteen heifers, four heifer calves. These cattle are kept for milk production, experimental feeding, experimental breeding, and to sell stock at reasonable prices.

Milk production.—Thirteen cows, aged 3 to 11 years, averaged 7,316 pounds of milk and 350 pounds of butter, which is 1,810 pounds of milk and 59 pounds of butter more

per cow than the average for the herd in 1913. Weeding out the low producers was the main cause of the increase. Calculating hay at $7 per ton, roots and silage at $2 per ton, meal at 1¼ cent per pound, pasture at $1 per month, it cost 87 cents to produce 100 pounds of milk, and eighteen cents to produce a pound of butter. With the latter at 28 cents per pound and skim milk at 20 cents per hundredweight, the cows gave an average profit of $48.74 over cost of feed. An interesting fact is that the best six gave a profit of 104 per cent over cost of feed, whilst the seven others only gave a profit of 54 per cent. It would probably pay to weed again next year.

Experimental feeding—Best quantities of meal to feed.—In 1913 and in 1914, fifteen cows were used for an experiment which lasted over 300 days altogether. These cows were a fairly uniform group as to weight, production, time elapsed since calving, and they were all fed the same quantities of roughage. A certain number received as much meal as they would eat, which was 1 pound per 2·25 to 2·5 pounds of milk; the next lot got 1 pound of meal per 4 pounds of milk; whilst the last lot were given 1 pound of meal per 8 pounds of milk. Partitions were put in between cows, in the mangers, so that no one could be robbed by her neighbours, and sawdust was used as bedding so that no straw could be eaten. The lot which received an unlimited quantity of meal averaged the most profit.

Cost of raising heifers.—It is the intention to find out exactly the cost of feed necessary to raise a heifer until she is in milk. All the feed given to three calves was weighed, and it cost $23.18 to bring each of them to 6 months, when their average weight was 361 pounds. Hay was valued at $7 per ton, roots at $2 per ton, meal at 1¼ cents per pound, whole milk at 1½ cents per pound, and skim-milk at 20 cents per hundred weight. It is probable that the cost can be decreased by feeding less whole milk and more skim-milk, and this will be tried another year.

Selling breeding stock at a reasonable price.—Nine cows have now qualified for Record of Performance, and none will be kept that cannot do the same thing.

SHEEP.

There are seventeen pure-bred Leicesters: one ram and sixteen ewes: five aged, seven shearlings, and four lambs.

POULTRY.

One breed only is kept, Barred Rocks. About 150 hens and pullets were wintered. A good building, comprising incubator, egg, killing, and feed rooms and a granary, was built; also a 32 foot by 16 foot permanent house for 100 hens, and three colony houses 12 feet by 8 feet.

BEES.

Sixteen colonies were put in the cellar of the Superintendent's house in the autumn of 1914. The average production of honey was 37 pounds per hive.

FIELD HUSBANDRY.

Work under this head comprises comparison of different rotations, cost of producing field crops, rates of seeding corn for silage, oats for grain, timothy and clover for hay, yield of hay with oats as a nurse crop sown at different rates, and yield of hay with different nurse crops.

ROTATIONS.

Three rotations have been compared: (1) Three-year, swedes, oats, clover; (2) four-year, swedes, oats, clover, timothy; (3) six-year, swedes, oats, hay, hay, hay, hay. In four years from 1911 to 1914, inclusive, the returns per acre increased 42 per cent

for the three-year rotation, 83 per cent for the four-year, and 30 per cent for the six-year. Though the relative increases may change with time, it is evident from these figures that proper rotation of crops pays.

COST OF PRODUCING FIELD CROPS.

Accurate records were kept of the cost of production of three of the main crops of the district: swedes, oats, and hay, on 13 acres of land, in 1914: a ton of swedes was produced for $2.18, a bushel of oats for 33 cents, and a ton of hay for $5.86.

RATES OF SEEDING CORN FOR SILAGE.

All corn grown on 39·46 acres since 1911, inclusive, was weighed. When sown in rows 48 inches apart and 8 inches in the row, it averaged 11·58 tons per acre; in rows 42 inches, 10·76 tons per acre; in hills 42 inches in all directions, 5·52 tons per acre; in hills 36 inches, 5 tons per acre. The average yield per acre, for the whole thing, was 8·32 tons.

CEREALS.

Work with cereals consists in trial of varieties, growing for sale or distribution the varieties which are best adapted to this district, and selection of the highest yielding strains by the head-row method.

TRIAL OF VARIETIES.

Four varieties of spring wheat, six of oats, three of six-row barley, and four of peas were tried on triplicate plots of one-sixtieth acre each. The results of four years show that the best varieties for this district are Huron wheat, Banner oats, Manchurian and Arthur peas.

FORAGE CROPS.

With forage crops, the work consists in variety tests, seed growing for sale or distribution, and selection of best strains as regards yield, hardiness, and composition.

VARIETY TESTS.

Nine varieties of Indian corn, five of carrots, eleven of mangels, four of sugar beets, and thirteen of swedes were tried on duplicate plots of one-hundredth acre each. The results of four years show that the following varieties may be recommended: corn for silage, Longfellow; carrots, Improved Short White; mangels, Yellow Intermediate; sugar beets, Vilmorin A; swedes, Good Luck.

SEED GROWING.

Seed has been grown of Good Luck swedes, and steps have been taken to grow seed of the best varieties of carrots, mangels, sugar beets, and Indian corn.

HORTICULTURE.

Work in this department is divided into fruit, ornamental gardening, and vegetables. It consists in testing varieties for earliness, yield, quality, hardiness, beauty, in cultural experiments, and in the propagation of the best kinds.

There are 1,118 apple trees of 122 varieties, 132 plum trees of 42 varieties, 50 cherry trees of 14 varieties, 11 pear trees of 4 varieties, and a number of the best kinds of grapes, currants, gooseberries, and strawberries.

Notes were taken of 1,401 varieties of ornamental plants: 269 annuals, 478 perennials, and 654 trees and shrubs.

Three hundred and four varieties or strains of vegetables were on trial, including twenty-two varieties of potatoes.

CULTURAL EXPERIMENTS.

These have been started in the orchards, to compare clover, rape, and vetches as a cover crop, also to compare these with clover followed by rape, and with permanent sod where the hay will be left on the ground for one part and taken off for the other. With vegetables, work will be undertaken to find out the best distances to thin, methods of blanching celery, of staking and pruning tomatoes, of controlling maggots, of starting onions, of forcing rhubarb, of treating potato tubers, etc.

FARM DEVELOPMENTS.

Many improvements were made during the year, the principal of which were a good system of waterworks and the macadamizing of 14 arpents of road fronting the farm. In buildings there were erected a poultry administration building, 18 feet by 26 feet, 2½ stories, and three colony houses 12 feet by 8 feet, whilst an implement shed, 80 feet by 25 feet, was moved next to the workshop. Nothing was done in fences, a few minor repairs only being made. About 10,000 feet of drains were put in, and a large open ditch dug, about half a mile long, to take away surface water coming from adjoining properties. Some 10 acres of land were cleared.

EXHIBITIONS.

Corn, roots, grain, vegetables, fruit, flowers, and honey were exhibited at Three Rivers and at Quebec, whilst a few things were sent to Sherbrooke. Ten horses and twenty head of cattle, all French Canadians, were shown at Quebec and at Sherbrooke. Every effort was made to bring out forcibly the educational side of the display, and competent men were in charge, glad to give visitors all reasonable information.

SOME WEATHER OBSERVATIONS taken at Cap Rouge, 1913.

	Temperature F.			Precipitation.				Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hrs.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
1914.								
April	54	6·2	30·12	1·19	6·8	1·87	·70	145·1
May	86	26·2	52·7	1·56	....	1·56	·70	[illegible]
June	86	32·2	56·36	3·28	....	3·28	·71	223·0
July	89	45·2	64·5	1·66	....	1·66	·58	279·8
August	92	40·2	61·9	4·43	....	4·43	·73	218·1
September	84	27·2	55·8	4·92		4·92	[illegible]	175·5
October	69	24·2	44·4	5·24	1·4	5·38	1·59	108·0
November	52	— 1·1	25·39	2·62	23·1	4·93	1·18	53·0
December	44	—22·8	13·7	·68	19·2	2·60	·50	76·3
1915								
January	45	—21·8	12·75	1·18	16·60	2·84	·50	52·9
February	34	—14·9	16·37	1·80	17·0	3·50	·70	78·2
March	40	5·2	22·3	......	3·20	0·32	·24	136·7
				28·56	87·30	37·29		1,787·2

EXPERIMENTAL STATION, LENNOXVILLE, QUE.

The land for this Experimental Station was purchased in the fall of 1913 and was taken over by the Department of Agriculture on April 1, 1914. It comprises an area of approximately 436 acres, 320⅔ acres in the township of Ascot, and the remaining 115⅓ acres in the corporation of the town of Lennoxville. The centre of the farm is about 1 mile from the centre of the town, one of the most central points in the nine counties comprising the Eastern Townships of the province of Quebec, which this farm is supposed to serve. Lennoxville has a population of 1,300, is located on the main line of the Canadian Pacific, Grand Trunk, Boston and Maine, and Quebec Central railways, which gives it the best railway facilities of any place in the Eastern Townships. It is also connected by electric car service, every fifteen minutes, with the city of Sherbrooke, the principal city in the Eastern Townships, which is only 3 miles distant and has a population of 19,000. To complete the description it may be stated that this farm is situated 104 miles east of Montreal, 28 miles north of the boundary line of Vermont, and is in latitude 45° 20′ north and longitude 79° 49′ west, with an altitude of 500 feet.

THE FARM.

The farm is made up of different areas purchased from the following gentlemen:—

R. W. Reid	168½	acres.
W. H. Pearson	150	"
E. Reed	108	"
W. J. Douglas	6½	"
H. Bennett	2¼	"
C. F. Carter	¾	"

making a total of 436 acres.

This farm is bounded on the north by the St. Francis river and the Cookshire road, on the east by divisional lines, on the south by the Canadian Pacific railway and divisional lines, and on the west by Bishop's College property. The surface of the farm near the river bottom is quite level, with undulating fields rising towards the south and east and from the high parts of which a magnificent view of the St. Francis valley and the town of Lennoxville may be obtained.

THE SOIL.

The soil near the river bottom is a clay loam, and 23,000 feet of tile was laid in these low-lying fields this past season. The soil of the fields rising from these flats is more of a sandy loam and is, of course, on that account well adapted for most crops. The land at the back of the farm is quite rough, never having been broken, and will be used for sheep pasturage until such time as it can be worked over and got into proper shape for crop production. There is approximately 20 acres of bush on the farm.

FIELD WORK.

When this Station was organized by the Dominion Department of Agriculture, April 1, 1914, the first work was drawing three carloads of fence posts from the station for the erection of farm fences. This was followed by drawing manure shipped from Montreal, which was applied to 25 acres of old timothy sod in very poor condition, but on which it was desired to grow corn in 1914. Breaking this sod began May 1, followed with a rolling to pack solid and conserve moisture; a little later discing was commenced with a double cutaway disc, on which were used four horses, followed by a 20-foot smoothing harrow, which put the soil into fine tilth. Corn planting was commenced on the 28th, Wisconsin No. 7 and Longfellow being the varieties used, sown in check rows 36 inches apart each way. A smoothing harrow was used until the corn

was well through the ground when a two-row riding cultivator was kept going as long as a team could work through, after which a one-horse cultivator was used for one cultivation. When this crop was cut in September it was found to be well cared and yielded a good tonnage. A 20-horsepower steam engine and large Blizzard blower were used to fill the silos. Considering the poor condition of the soil and the quality of manure used, the crop secured demonstrated very conclusively that the district is well adapted to the raising of this important crop. There was also sown on land ploughed in the fall of 1913 for former owners, 49 acres of Banner oats, and 10 acres of two-row or duckbill barley. Thirty-four acres of this 59 were seeded down to timothy and red clover at the rate of 10 pounds of each per acre. The grain was harvested in the latter part of August but had to stand in the shocks for some time on account of rainy weather. When dry it was drawn from the shocks and threshed at once, yielding approximately 45 bushels of oats and 36 bushels of barley per acre.

FENCING.

Fencing was commenced in the month of September on the north boundary of the farm, and was continued around the farm a distance of 4½ miles, using a 4-foot woven fence, nine strands, No. 9 galvanized wire, with stays 16 inches apart, posts set 16 feet apart, 3 feet deep with corner and brace posts 4 feet deep, well braced and anchored. Some divisional fences were also completed.

ROADS.

The main travelled thoroughfare through the farm is the Cookshire-Eaton road, which is the outlet of a large farming district in the counties of Compton and Wolfe to the city of Sherbrooke.

DRAINAGE.

Twenty-three thousand feet of tile were laid this past season according to plans and specifications drawn up by the Field Husbandry Division of the Central Experimental Farm, Ottawa. There was also 1½ miles of open ditch opened up, 6 feet at top tapering to 2½ at bottom, 3 feet deep.

BUILDINGS.

There are six houses on this property, three of which have been painted, papered, fitted throughout with hot and cold water, and electric lights installed. One of these is occupied by the Superintendent, one by the foreman, and the other is used as a boarding house.

The barns used are those which were on the different properties when taken over, very little outlay being put on them, in expectation of new buildings being built soon. The horse stable which was on the property formerly owned by R. W. Reid includes space for twelve horses and a harness room, and is used for that purpose; the balance of the horses, six in number, are stabled in the R. W. Reid barn, the remainder of said barn being used for beef steers and sheep. The barn on the property formerly owned by E. Reed is also used for cattle.

SILOS.

Two stave silos were erected this past summer, 18 feet in diameter, 30 feet high, with a capacity of 320 tons.

WATER SUPPLY.

Water for use at the Superintendent's, foreman's and boarding houses, also the barns on the R. W. Reid property, is furnished from a driven well 16 feet deep which is connected up to a Heller-Aller compressed air tank system, the pump being run by electric current.

LIVE STOCK.

Horses.— There are now at this Station three imported registered Clydesdale mares, three Canadian-bred registered Clydesdale mares, ten other well-graded Clydesdale work horses, one driving horse, and one registered foal dropped on September 1, 1914.

Cattle.—Seventy-eight beef steers were fed at the Station this past winter. Forty-eight of these were sold on March 30, the balance are still on hand and will be ready for market the first of May. These cattle were fed on corn silage, hay, and concentrates consisting of bran, barley, cotton seed and oilcake meal.

There were also two different feeding experiments carried on, the results of which will be found in the Dominion Animal Husbandman's report.

Sheep.—Fifty-four common grade ewes of different breeds were purchased locally from different farmers, with the object of experimenting in the eradication of weeds, such as the orange hawk weed, better known in the Townships as the paint-brush, ox-eye daisy, etc., with which the rough pasture land in this section is badly infested. It is also proposed to carry on a grading experiment with this flock by using the best registered rams of some particular breed, probably Oxford, for a number of years, and the selection of the best ewe lambs for breeding purposes with a view to demonstrating to the farmers the improvement that can be made in their flocks by working along such lines. The quality and quantity of wool, and the weight of the sheep and lambs will be taken into consideration each year.

HORTICULTURE.

One of the first things done at the opening of this farm was the planting out of a nursery of ornamental trees and shrubs for future use. These have done very well through the summer and after this season a report on their hardiness can be made. There have also been set out twenty-six varieties of strawberries, which will be ready for permanent plantation this spring.

VEGETABLES.

Tomatoes.—One-half acre of tomato plants of different strains, bred at the Central Experimental Farm and sent to be tested out for earliness and productiveness was set out. Alacrity-Ponderosa was found to be a very prolific variety, with Alacrity-Dwarf Stone not far behind, being a very abundant bearer and with fruits almost free from roughness.

Corn.—Fifty-four varieties of sweet corn were planted June 5. The season not being very good for corn, most of these varieties did not mature sufficiently for use. It was found that Early Dawn was the earliest and of a very good quality, Malcolm next, and Malakoff not far behind.

Potatoes.—Six different varieties of potatoes were planted for hill selection. These were Carman, Empire State, Early Ohio, Green Mountain, Irish Cobbler and Gold Coin. Of these varieties a selection of one hundred hills of each was made, and also one hundred hills as they came in rows. It was found that some of the varieties of selected hills produced 100 per cent more than the unselected.

FLOWERS.

Several varieties of perennial flower seeds were planted July 16, and these will be used for perennial borders later on. They came on very well, were transplanted into beds, and many of them were in bloom before winter set in. There is also a collection of narcissi, tulips, and hyacinths in the ground ready for flowering this spring.

GENERAL WORK.

Through the winter months hot-bed frames were made, sashes painted and glazed, stakes labelled for orchards and vegetables, and all other preparatory work completed.

Ten acres for cultural orchard, 8 acres for variety orchard, vineyard and other small fruits which will be planted this spring, were set aside.

EXHIBITIONS.

There was shown from this Station, in conjunction with the Central Experimental Farm exhibit at Canada's Great Eastern Exhibition held at Sherbrooke in September last, a small exhibit, consisting of vegetables of different varieties, field corn, flowers, grasses, and grains.

MEETINGS.

During the months of February and March, the Superintendent attended thirty-four meetings in the different counties comprising the Eastern Townships in connection with the Patriotism and Production campaign. Much assistance was given in these meetings by the staff of the Central Experimental Farm, Dominion Department of Agriculture, and the Commission of Conservation, Ottawa. These meetings gave the Superintendent a good opportunity of studying the conditions in the different sections and of getting in touch with the farmers, who appeared to be very anxious to gain any information possible along agricultural lines.

MISCELLANEOUS.

Visitors.—Although this farm has been in existence only since April 1, 1914, many visitors from the different sections of the Eastern Townships have taken the opportunity of visiting it.

EXPERIMENTAL FARM, BRANDON, MAN.

The season of 1914 at Brandon began rather favourably, and until July 1, crop conditions were good. However, a period of extreme heat with drought and high winds set in during June and continued throughout July and into the month of August. This brought on extremely early maturity of crops and consequent shrinkage of yield. Harvesting was completed by August 13 on this Farm, or about the time that it usually begins. Grain crops were about two-thirds to three-quarters of a normal yield, and all other crops suffered proportionately.

TESTS OF CEREALS.

The usual tests of varieties of cereal grain crops were conducted on uniform duplicate plots. Marquis wheat, as usual, excelled all other varieties. Its advantage over Red Fife was greater than usual this year as the Red Fife, being later, suffered much more severely in the hot winds. The five-year averages for these two varieties are: Marquis, 42 bushels, 36 pounds per acre; Red Fife, 37 bushels 23 pounds per acre. In oats, some of the earliest varieties gave best results this year on account of the dry weather, but the Banner variety makes the best showing on the five-year average. The varieties of barley that are giving best results are: Manchurian, Garton's No. 68, and O. A. C. No. 21. Of nine varieties of peas grown, Arthur is considered the most desirable on account of its earliness. Three varieties of flax obtained from the North Dakota Agricultural College have done very well; N. D. R. 52 has given the best two-year average.

FIELD HUSBANDRY.

The work with crop rotations is one of the most important being conducted on this Farm. Eight rotations, occupying more than half the land on the Farm, are being tried out. They include a straight grain-growing rotation various stages of the development of mixed farming, and various arrangements of crops in the mixed-farming system. Very satisfactory results are being obtained, showing conclusively that greater returns are possible from a diversified, balanced system of farming than can be obtained from growing grain only.

The extensive system of cultural experiments inaugurated in 1911 has been continued, and a large mass of figures is being collected which it is hoped will give valuable information in regard to the best methods of soil cultivation. Among the lines of investigation being followed are: depth of ploughing, methods of handling summer-fallow, methods of handling stubble land, breaking sod, seeding down, applying manure, green manuring, preparation of seed-bed, soil packers, depth of seed, fertilizers and drainage.

FORAGE CROPS.

Experiments with different varieties of grasses, alfalfa, clovers, and mixtures of the same, gave very interesting results. Alfalfa shows itself to be decidedly the most productive forage crop, whether alone or in mixtures. Western Rye grass also gave good results. Experiments with crops that may be used for growing hay the same season as sown, showed oats to be the best, considering both yield and palatability. Hairy vetch also gave good results for this purpose.

Seventeen varieties of Indian corn were tested. The yield of fodder was less than usual, but six varieties produced ripe grain. Among the best varieties of fodder corn for Manitoba are: Northwestern Dent, Longfellow, Minnesota No. 13, and North Dakota White. Fourteen varieties of turnips, thirteen of mangels, and five of field carrots were tested.

HORTICULTURE.

The usual tests of a large number of varieties of vegetables were made, and are reported in detail in the horticultural report. The season was very unfavourable for most kinds of vegetables, but by means of thorough cultivation, good yields were obtained. Notes were taken on the appearance and table quality of the vegetables, as well as the yield and date of being ready for use.

A good crop of apples was harvested from many of the cross-bred trees originated by the late Dr. Wm. Saunders, and from seedlings of these cross-breds. Some few standard apples were grown, but not in commercial quantities. An effort is being made to originate a hardy standard apple through the use of large numbers of seedlings of the hardiest kinds obtainable. Over ten thousand of these seedlings are now being grown.

The plum crop was hardly up to average, and yet quite a large quantity of plums of selected native strain was grown. This type of plum is found to be the best.

Tests of varieties of strawberries, currants, gooseberries, and raspberries are being conducted and the hardiest varieties being determined. Good results are being obtained.

The display of flowers was the poorest in many years. The heat and shortage of water were the cause. However, even under these circumstances, the flowers were fairly attractive and some valuable information was obtained as to the most drought-resistant varieties. Perennials did well despite the dry weather. The trees and hedges form a constant demonstration of the possibilities of the country, and as to the proper kinds to use.

LIVE STOCK.

The cattle kept on this Farm are Shorthorns of the dual-purpose type. Some of them are proving very satisfactory milkers. One has made an official Record of Performance record of 12,655 pounds in one year. Records have been kept of the feed used by each animal, and as a result data are available as to the cost of milk production and the raising of young cattle.

An experiment in steer-feeding in which corn ensilage was compared with dry corn fodder was completed in the spring of 1914. The result was strong evidence in favour of the use of silos for the storage of corn. The experiment which is being conducted this winter, 1914-15, is a comparison of corn silage and straw *versus* alfalfa hay *versus* mixed grass hay, and also outdoor feeding *versus* stabling. The experiment is not completed.

The flock of breeding ewes has been utilized for an experiment in comparing alfalfa *versus* mixed hay, and also wintering in a rather expensive sheep barn *versus* an open shed. The alfalfa gave best results as a feed, and no great difference could be observed as a result of the difference in shelter. Data on the cost of feeding sheep are also being collected.

An experiment in pig feeding was conducted in which barley was used as the main food, and other foods were tested as regards their suitability for mixing with barley. Feed flour mixed with barley in the proportion of 1 to 3 gave best results, pure barley second best, shorts and barley came third, with chopped oats and barley a poor fourth. Wintering sows outdoors is also being more fully demonstrated as the best method.

POULTRY AND BEES.

The White Wyandotte and Barred Rock breeds are kept. Colony houses are used exclusively on this Farm, and are found quite satisfactory. Experiments were conducted in different types of construction, and figures are presented in the poultry report showing the temperatures recorded. Egg records kept show the pullets to be much better winter layers than the 1-year-old or older hens.

The apiary on this Farm is being used as a source of supply in stocking up the newer Stations. It has been handled more for multiplication than for honey production. Nevertheless, a fairly good crop of honey was garnered, despite a very unfavourable season.

BUILDINGS.

A new solid concrete silo, 16 feet across inside and 34 feet high, was built this year. A stave silo has been in use some years, and it will now be possible to compare the two kinds. A large cement root-house was built under ground in the side of the hill behind the cattle barn. A shed for the threshing separator was also built this year.

EXHIBITIONS.

A large exhibit got up at the Central Experimental Farm was shown at the Brandon and Winnipeg summer fairs. In addition, an exhibit showing some of the work of the Brandon Farm was shown in combination with the general exhibit. An exhibit of horticultural products was made at the annual show of the Brandon Horticultural Society in August 1914.

MEETINGS.

The Superintendent addressed meetings of Manitoba farmers at the following places in the province during the year: Virden, Reston, Souris, Hartney (twice), Melita, Morris, Emerson, Stonewall, Portage la Prairie, Neepawa, Carberry, Carman (twice), Elgin, Hamiota, Oak River, Russell, Birtle, Roblin, Grandview, Gilbert Plains, Dauphin, Valley River, Sifton, Ethelbert, Bowsman, Swan River, Benito, Durban, Kenville,

Minitonas, Ste. Rose du Lac, and Makinak. "Rotation of Crops," "Corn Growing," and "Practical Methods of increasing Production," as well as several other topics, were taken as the subjects of addresses.

The assistant Superintendent judged Seed Fairs and addressed meetings at Minnedosa, Kelwood, and Roblin, speaking at each place on "Hog Raising."

VISITORS.

It is estimated that about 10,000 persons visited the Farm during the year.

METEOROLOGICAL RECORD.

The meteorological record for the year is as follows:—

Months.	Highest Temperature. F.	Lowest Temperature. F.	Mean Temperature. F.	Total Rainfall.	Total Snowfall.	Hours Bright Sunshine.
	°	°	°	Inches.	Inches.	
1914.						
April	69·9	5·8	35·9	2·32	2	141·6
May	80·4	19·8	45·6	2·28	....	196·1
June	88·2	31·5	57·6	2·38	....	179·6
July	101·5	42·5	70·3	1·91	....	267·1
August	102·	29·	62·5	1·02	....	239·
September	87·	26·6	55·1	2·45	....	208·9
October	82·5	13·5	47·	1·54	....	157·8
November	61·6	—27·8	22·1	·03	7	104·3
December	32·5	—31·8	2·7	....	1	82·4
1915.						
January	30·5	—42·5	— 1·	....	7	98·5
February	32·	—20·	14·1	....	2	85·8
March	52·1	—15·8	23·1	....	4	193·3
Total	....	....	....	13·93	23	1,954·4

Reckoning 10 inches of snowfall as equivalent to 1 inch of rainfall, the total precipitation for the year ending March 31, 1915, was 16.23 inches.

EXPERIMENTAL FARM, INDIAN HEAD, SASKATCHEWAN.

WEATHER CONDITIONS.

The season of 1914 was far from being favourable for the production of cereal, fodder, or horticultural crops. While there was considerable moisture in the soil from the fall and early spring rains, the dry weather which prevailed during the latter part of May, June, and July resulted in a very short crop of hay, light yield of grain, and vegetables and fruits of an inferior quality. A severe frost on August 9 completely destroyed many of the more tender vegetables and flowers, greatly lowered the feeding quality of ensilage corn, and caused the late-sown wheat to be reduced in quality from one to three grades. The dry weather and frost resulted in the harvest starting one month earlier than the previous season so that the grain was all threshed and much of it marketed early in the season, allowing a large amount of time for fall cultivation. This facilitated the preparing of a larger acreage for crop in 1915.

INVESTIGATIONS IN PROGRESS.

Cereals.—Four named varieties of wheat were under test in 1914. Of these the Marquis is best adapted for the climatic and soil conditions of southern Saskatchewan. While the Prelude was the only wheat which matured before the frost, the yield was so

low that it is not likely to become a commercial wheat in this portion of the province. Out of the large number of varieties of oats grown, the Victory and Banner are among the best. The Manchurian and O. A. C. No. 21 barleys were again among the highest yielders of the six-row type. The two-row sorts did not yield as high, and have a considerably weaker straw. Among these the Canadian Thorpe and Gold gave good results. Premost flax was the highest yielder. Novelty, a new variety produced by Dr. Saunders, gives promise of equalling, if not surpassing, Premost. Arthur and Solo peas gave best satisfaction, maturing much earlier than the other sorts.

Forage Crops.—From the result of tests of different grasses, the Western rye seems to be the best adapted for the production of hay, and Brome for permanent pasture. Among the legumes, alfalfa is best suited to conditions in southern Saskatchewan. At Indian Head the Grimm and Baltic varieties have again given best results. While the fodder corn was badly damaged by frost, it gave a large amount of fodder which was stored in the silo. While this was not equal to the silage produced in former seasons, it supplied a large quantity of succulent feed during the winter. The Northwestern Dent gave best satisfaction. Varieties of turnips, mangels, sugar beets and carrots were tried out at Indian Head this season. For soiling or early fall feeding the fall turnip will give good results and produce a high yield, but for winter feeding only swedes should be used, as they are good keepers and can be fed until the early spring.

Horticulture.—A large number of the varieties of the different kinds of vegetables have been under test for five years, and the inferior sorts will be eliminated this season, giving more time and space for the conducting of cultural experiments with vegetables. The perennial flowers which have proven perfectly hardy are being increased in number, and the seed and roots will be distributed as soon as a supply can be obtained. An endeavour is being made to acclimatize or originate a standard apple that will produce in southern Saskatchewan. A large number of seedlings of the hardy varieties are being propagated, and it is hoped that some of these may produce an edible apple hardy in the West.

Some of the plantations of forest trees which were set out some years ago were cut out during the fall and made into cordwood. Besides the trees in the avenue, plantations, and windbreaks, a large arboretum is maintained. Many of the trees being tried out are proving hardy, and will make magnificent lawn trees. Among the deciduous specimens the Manitoba maple, green ash, and birch are proving most satisfactory. Of the conifers, the Scotch pine seems to be most hardy. Caragana and lilac are both hardy plants, and produce an abundance of bloom in the early spring.

Field Husbandry.—While the season was unfavourable for the production of crops, the results obtained from the field husbandry experiments were very satisfactory, and quite a number of lessons in moisture conservation were learned. A large portion of the Farm is divided into small plots for the purpose of studying different methods of cultivation and crop management and such problems as different methods of summer-fallowing, preparing stubble land for crop, depth of ploughing, methods of packing and different crop rotations are being studied.

Live Stock.—The experimental work with horses includes the cost of producing work horses from both pure-bred and grade mares, and different methods of feeding the idle horses during the winter. The Clydesdale is the breed that is being used.

A start was made to develop a dual-purpose herd of Shorthorn cattle. This season all cows which freshened were put into the test, and the better milkers will be bred to bulls from recognized milking strains.

In the winter, a large amount of experimental feeding is conducted.

This season, two carloads of steers were fed, and such questions as the most profitable age, the best method of sheltering and different rations were investigated.

Shropshire sheep are the breed kept on this Farm. The pure-bred flock is not very large at present and, as it was believed that the sheep could be utilized to good advantage in keeping down the weeds on the summer-fallow, one hundred ewe lambs were purchased last fall and put on feeding experiments during the winter. These will be pastured on the fallow fields and roadways during the summer, and in the fall will be bred to pure-bred rams and their offspring used in feeding experiments. A car-load of wether lambs were also fed. These were purchased from a rancher near Lethbridge, and a record kept of the loss in shipping and cost of delivering the lambs at Indian Head. They were then broken up into lots of about twenty-five each, given different degrees of shelter and fed different rations.

Two breeds of hogs are kept at the Indian Head Farm—Yorkshires and Berkshires. No experimental work has been carried on with swine, as a piggery would be necessary for the conducting of it.

The poultry was increased by purchasing a number of bred-to-lay Barred Rocks and White Wyandottes from breeders in Quebec. These were kept in cotton-front houses of different types. In the houses a thermometer was kept which gave a record of the maximum and minimum temperatures.

BUILDING.

During the year very little building was done at this Farm. In the fall an implement shed was put up. This was used during the winter for feeding steers and sheep, but will be utilized in the summer for the farm machinery. A number of the older buildings were repaired and painted, which gave them a somewhat better appearance.

EXTENSION WORK.

During the summer months the Superintendent spent one week on the Provincial Government demonstration train, which at that time was touring the Weyburn-Lethbridge line, and delivered lectures on conservation of moisture and the importance of good seed. In June he also gave two lectures in Regina, before the Convention of Agricultural Secretaries, on soil cultivation and forage crops. In August he visited the Rosthern Experimental Station at the time of their annual excursion, and discussed the varieties under test with the excursionists. In the fall he judged at several seed fairs and gave addresses on the work of the Indian Head Experimental Farm at Windthorst and Grenfell. In December he attended a Farmers' Convention in North Battleford, and gave lectures on moisture conservation and crop rotation.

VISITORS.

During the summer a large number of farmers from outlying districts called at the Farm and discussed their problems with the Superintendent. He also endeavoured to go out when possible and visit the farmers in the vicinity of Indian Head, and discuss with them their problems.

EXHIBITIONS.

In conjunction with the exhibit prepared at Ottawa, one was prepared at Indian Head, which gave an outline of the work being conducted and the results being obtained. A panel setting forth the yields of wheat obtained by different methods of summer-fallowing was the centre of attraction at the fairs where it was on exhibition.

METEOROLOGICAL RECORDS, EXPERIMENTAL FARM, INDIAN HEAD.

Month.	Temperature F.					Rainfall.		Snowfall.	Sunshine
	Maximum.		Minimum.		Mean.				
1914.	Date.	°	Date.	°	°	Days.	Inches.	Inches.	Hours.
April	15	70	6	2	37·53	2	·09	12·	158·5
May	27	83	10	22	50·54	2	·58	10·	243·4
June	2	90	13	40	59·06	6	2·28		219·6
July	27	100	16	42	69·80	3	1·50		304·6
August	7	89	9	29	59·42	5	1·33		231·6
September	18	88	23	28	54·73	3	·47		181·9
October	1	80	25	10	44·29	4	1·16		126·2
November	2	56	17	—23	24·33	2	1·3	9·	65·7
December	3	27	25	—32	1·93			4·50	23·3
1915.									
January	18	30	27	—42	3·06			4·50	37·1
February	17	37	5	— 8	16·82			5·25	71·6
March	21	51	2	—17	22·55	2	·75		195·6
						29	8·29	45·25	1,859·2

EXPERIMENTAL STATION, ROSTHERN, SASK.

CHARACTER OF THE SEASON.

The season of 1914 opened auspiciously; seeding was done in good time and, until the middle of June, growth was more than normal and crops promised a higher than average yield. The expected June and July rains did not come, however, and all crops, especially those put in under any but the most favourable conditions, suffered heavily during July from drought and at harvest time much of the grain was so poorly developed that some fields were not cut. It was a season which sharply defined the careful farmer from the careless one.

Following is the meteorological record for the year April 1, 1914, to March 31, 1915:—

Month.	Temperature F.					Precipitation.			Sunshine.
	Highest	Date.	Lowest.	Date.	Mean.	Rainfall.	Snowfall.	Total.	
1914.	°		°		°	Inches.	Inches.	Inches.	Hours.
April	69·1	16th	5·3	19th	35·8	0·48	1·5	0·63	209·7
May	80·1	16th	22·2	10th	49·8	1·96		1·96	264·3
June	84·2	16th	33·3	25th	58·7	2·00		2·00	308·3
July	93·8	28th	41·2	23rd	67·5	1·40		1·40	339·6
August	87·0	2nd	32·8	10th	60·0	1·12		1·12	273·9
September	79·3	19th	30·1	21st	50·9	0·97		0·97	203·0
October	81·2	1st	16·7	26th	42·5	1·57		1·57	145·7
November	49·9	1st	—20·0	17th	21·7	0·31	8·9	1·20	100·0
December	23·8	1st	— 31·8	25th	1·1		5·2	0·52	49·5
1915.									
January	30·3	5th	—45·5	27th	0·2		6·0	0·60	103·6
February	29·0	18th	—13·3	1st	8·8		5·0	0·50	134·7
March	43·0	22nd	—14·8	2nd	17·7			0·00	190·6
Total from April 1st, 1914, to March 31, 1915						9·81	26·6	12·47	2,322·9

EXPERIMENTAL WORK.

The experimental work begun in 1911 in cultural methods has been continued but, owing to irregular areas being affected by alkali, the results have been anything but satisfactory. Experiments seeking the relative merits of varieties have been continued in cereals, legumes, roots, corn, and potatoes. Last year there were some hybrid beardless barleys, originated by Dr. Chas. Saunders, tried with very satisfactory results. A number of varieties that had proved unsatisfactory in previous years were discarded last year.

FARMERS' EXCURSIONS AND VISITORS.

With the co-operation of the Canadian Northern Railway, an excursion to the Experimental Station was arranged for July 9 from points west of Prince Albert as far as Blaine Lake and east as far as Tisdale. Special trains were run for the occasion, arriving at 11 a.m. and leaving at 5 p.m.

Assistance was rendered by the Superintendent of the Indian Head Experimental Farm and members of the staff of the University of Saskatchewan. Upwards of three hundred farmers, with their wives and families, availed themselves of the holiday, and altogether the event was so satisfactory to both the railway officials and the management of the Experimental Station as to warrant them in making it an annual affair.

EXHIBITIONS.

The Rosthern and Scott Experimental Stations joined in making an exhibit at the Saskatoon and Prince Albert Exhibitions, representative of the work done at the two Stations. There was a display of fruits, vegetables, flowers, grains, and fodder crops. The exhibit was in charge of an officer from the Central Farm, who also displayed the work of the various Divisions at Ottawa. This exhibit elicited much favourable comment from both the visitors at the exhibitions and the Exhibition Boards.

MEETINGS ATTENDED.

The Superintendent attended a conference of Experimental Farm Superintendents and Dominion Farm officers in Ottawa during January, and attended a series of twenty-five meetings on Patriotism and Production held in various parts of the north of the province during February and March.

ADDITION TO THE STATION.

During the past year the Government extended the area of the Experimental Station by the addition of three quarter-sections and a strip of 15 acres along the Canadian Northern railway. The Station now comprises almost a complete section, besides the strip along the railway, a total area of nearly 650 acres. The new land is mostly level and very uniform, and will lend itself satisfactorily to experimental work. It has been cropped for several years and is in rather poor tilth, and most of it will have to be summer-fallowed the coming season.

NEW BUILDINGS.

In the summer of 1914 a foreman's house was built 22 feet by 26 feet, two stories high, with full cement basement, hot-air furnace, waterworks and sewage disposal. The water pressure is obtained from a tank 2 feet by 2½ by 5 feet in the attic, and the supply is obtained from a well just outside the house, and may be pumped either by hand or by gasoline engine power. The whole plan lends itself admirably to the requirements of an ordinary farm.

LIVE STOCK.

Cattle.—There are two cows kept at the Experimental Station. These are of the dual-purpose Shorthorn type, and supply sufficient milk for the requirements of the families living at the Station. There were purchased last year two Holstein heifers of good breeding.

Horses.—The five work horses and two drivers kept at the Station were in good condition throughout the past year, and were sufficient to do the work. At times it was necessary to call on one of the drivers to help out in the farm work.

Owing to the extension of the farm it was necessary to purchase eight more work horses in March. Two of these are of the Belgian draught type and the remainder of the Clydesdale type.

WATER SUPPLY.

The water used at the Station has been supplied by shallow wells, and has been insufficient for the requirements. A well was drilled to a depth of 106 feet, and a supply of water obtained reaching to within 20 feet of the surface of the ground. After pumping for a day the supply was shut off by sediment. This was cleaned out and the pumps started again with the same result. An attempt will be made to solve the difficulty during the coming season.

EXPERIMENTAL STATION, SCOTT, SASK.

CHARACTER OF SEASON.

Without exception, the season of 1914 was the most unfavourable for crop yields ever experienced in northwestern Saskatchewan. The snowfall during the winter of 1913-14 was very light. Spring opened up about the usual time. Seeding operations commenced on April 11. Typical April weather was experienced, with low temperatures, and more rainfall than in previous years. May was considerably warmer with a few small showers. The usual June rains did not materialize, and July and the first of August were warm and dry. During the last of July and the first part of August, hot winds prevailed, which did considerable damage to crops of all kinds. Considerable rain fell during September and first part of October, which, while too late to benefit the past season's crop, left the ground in good condition for ploughing, and for the succeeding season's crop operations. Total precipitation from April 1 to August 15 was 7·22 inches.

TESTS OF CEREALS.

The comparative test of varieties of cereals is one of the most important of the many lines of experimental work conducted on this Station.

In varieties of wheat tested, Marquis and Red Fife have again demonstrated their superiority. In the test of oats, Banner gave the heaviest yield, while Ligowo holds the record for three-year average. Victory, which had given such splendid yields in the two previous years, was accidentally omitted from the test. O. A. C. No. 21, and Manchurian are two of the most satisfactory varieties of six-row barleys. Duckbill, a two-row variety, has yielded remarkably well. The Arthur peas have proved to be earlier maturing and higher yielding than any other variety tested on the Station.

FIELD HUSBANDRY.

Crop rotation.—The crop rotations on this Station have not been under way for a sufficient period to warrant definite statements being made as to the relative merits of the different systems. Especially is this the case where the treatment calls for

the application of barnyard manure in the rotation. A noticeable feature of this year's returns from the rotations was the fact that the check plot "A," continuous wheat, was the only system which was operated at a loss.

Rates of seeding.—In the amounts of seed per acre, a compilation of the results of the last three seasons' tests points to the conclusion that less amounts of seed than are commonly used of oats and barley will prove more profitable. One bushel per acre of each of these kinds has given higher yields than any other amounts tested.

CULTURAL PLOTS.

The scope of the cultural investigation work has been considerably augumented by the addition of eight experiments.

A few conclusions might be drawn from the four experiments that have been under way for two years.

Use of soil packer.—In the use of soil packers, sufficient evidence has accumulated to indicate that packers are of considerable value in the preparation of the seed-bed, providing, however, that they are not used where the surface soil contains a high percentage of clay, or when the soil is too wet. The most profitable times to use the soil packer appear to be immediately after ploughing and immediately after sowing.

Breaking new sod.—The experiments in methods of breaking the prairie point to the conclusion that ploughing the sod 4 or 5 inches deep, early in June, and cultivating throughout the season, is the most profitable system to adopt.

Depths of seeding.—In the depth of seeding experiment, sowing from 2 to 3 inches deep appears to be the most satisfactory for both wheat and oats.

HORTICULTURE.

Considerable progress has been made in connection with the horticultural work of this Station. A splendid catch of Kentucky Blue grass on the lawn has been the admiration of visitors. The trees and shrubs, planted in groups on the lawn, are thriving. Each year's growth adds considerably to the effect. A number of trees in the arboretum have proved somewhat tender, but a long list of varieties have shown themselves quite hardy.

In the flower border, the paeonies have made a splendid start. Besides the annual flowers, which were sown in the hotbed, and transplanted to the flower border, twenty-seven varieties of annuals were sown outside, most of them blooming splendidly.

Vegetables.—The dry summer seriously affected the yields of vegetables, potatoes only yielding about half an average crop. Corn, cucumbers, and tomatoes were just commencing to bear when the frost came.

LIVE STOCK.

The live stock on the Station at the present time consists of fourteen head of work horses.

Experimental work has been restricted to investigations into the cost of wintering idle work horses, and the cost of raising colts, the average cost of feed for two 3-year-old colts, from time of weaning until three years old, amounting to $56.24.

EXTENSIONS TO THE STATION.

One-half section (320 acres) of land, adjoining the Station, has been purchased for the purpose of extending experimental work in crop production, and providing sufficient feed for further experimental work with live stock.

About 100 acres of new land have been broken up during the past season.

BUILDING AND FENCING.

A comfortable cottage has been built for the farm foreman. The fence around the Station has been neatly painted, and the land purchased has also been fenced. In all, approximately 2½ miles of woven wire fencing have been erected.

EXHIBITIONS.

In conjunction with the Rosthern Station, an exhibit was staged at the Saskatoon Summer Fair.

VISITORS.

Nearly 900 people visited the Station during the past year. An excursion of farmers from the surrounding district visited the Station in July.

MEETINGS ATTENDED.

Since his appointment in August, the acting Superintendent has attended the Superintendents' conference in Ottawa in January, addressed meetings at twenty-two points in southern Saskatchewan, in connection with the Patriotism and Production campaign, and has spoken at a number of local Farmers' Institute meetings. He also assisted in the selection and laying out of a few of the Illustration Stations in the southern part of the province.

SOME Weather Observations taken at Scott Experimental Station, 1914-15.

Month.	Temperature F.			Precipitation.				Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hrs.	
1914.	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
April	37·8	76·5	9·1	1·36	....	1·36	·48	184·5
May	49·0	82·0	18·4	1·05	1·0	1·15	·22	295·4
June	56·9	85·0	34·1	2·37	....	2·37	·46	211·4
July	67·0	96·8	35·2	1·80	....	1·80	·95	309·0
August	59·5	90·5	30·2	1·41	....	1·41	·55	235·1
September	55·2	80·0	28·2	3·46	....	3·46	2·20	192·8
October	41·13	70·1	18·2	3·17	....	3·17	1·75	143·7
November	23·69	51·8	—17·3	....	6·0	·60	·60	100·4
December	2·57	24·8	—23·3	....	18·0	1·80	·60	26·3
1915.								
January	1·49	31·8	—42·0	....	1·0	·10	·10	89·0
February	13·27	30·2	—10·8	....	1·5	·15	·10	111·5
March	41·1	44·8	— 4·8	....	·5	·05	·05	216·7
Total for year	....	....	....	14·62	28·0	17·42	....	2,115·4

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

THE SEASON.

The season of 1914, on account of the very severe drought, will long be remembered as the most trying since settlement has taken place. In some localities, 1910 was just as unfavourable, but the areas affected were more restricted. The rainfall was a little greater near the foothills country on the west and along the Aldersyde branch of the Canadian Pacific railway from Carmangay northwest, but over the balance of southern

Alberta the precipitation was so light that absolutely no grain crops were obtained except on well summer-fallowed fields, and the yields in these cases were, of course, very light. Although it is most unfortunate that the district has had to experience such a lamentable disaster as a practical crop failure, still, one advantage is gained which is that the farmers are brought face to face with the fact that summer-fallowing must be practised on a very much greater scale than has been the case in the past, if similar failures in the future are to be avoided.

In regard to the amount of moisture carried in the soil from 1913 it might be said that the precipitation during the last four months of that year was light, amounting in all to only 2½ inches. During this period, heavy drying winds were prevalent, with little or no snow on the ground, so that the soil moisture was severely drawn upon. To counteract this in a measure, however, 3·63 inches of precipitation was received during the first three months of this year, i.e., January, February, and March, so that the soil was reasonably moist and in excellent condition when work on the land was started.

The first discing, harrowing, or seeding on the Station occurred March 17. The ground froze up toward the latter part of March but opened again shortly, and seeding was begun April 4. Unfortunately, the rainfall during April, May, and until the latter part of June was very much less than usual. For this entire period no soaking rain was experienced. What did come was in the form of light showers that were not sufficient to wet through the dry layer of 2 or 3 inches at the surface and connect with the moisture lower down. The fact that the total precipitation for April and May was only 0·83 of an inch fully illustrates how serious conditions were and how difficult it was to obtain a stand from seeds when sown. A wet spell during the last ten days of June revived things generally, but the dry, hot July was too severe a strain on plant life. Corn, late-sown roots, and potatoes, which were able to profit by the August rains, gave reasonable returns, although they, of course, did much better on summer-fallow. The last frost in the spring occurred on May 12, when a temperature of 29·8° F. was recorded. The first frost in the fall was on September 15, when the temperature dropped to 31·0° F.

CROP YIELDS.

Non-irrigated.—All crops except those sown on summer-fallow and corn land were a practical failure. Field lots of spring wheat sown on summer-fallow averaged a little over 15 bushels per acre, and winter wheat, 14 bushels. The yields of oats and barley were in proportion. Peas and oats sown as a mixture on summer fallow for green feed gave a return of 1 ton and 500 pounds per acre of field-cured hay. The yield of wheat after corn in one of the rotations was greater than wheat on summer-fallowed land. This is rather remarkable considering the extremely dry season, and indicates the possibilities of the dry-land farmer producing a good supply of winter fodder on land that otherwise would be in fallow and returning nothing. Hay, including alfalfa, clover and grasses, failed to make sufficient growth to be worth cutting, except alfalfa in rows, which gave light returns.

Irrigated.—The yields of grain were fully up to the normal. All kinds of hay gave returns slightly in excess of those obtained in 1913.

EXPERIMENTS IN ROTATION OF CROPS.

Non-irrigated.—The necessity of having a summer-fallow introduced every second or third year in the crop rotations was fully emphasized. There are now seven rotations laid out on the dry part of the farm. In addition to these, there is really an eighth one comprising an experiment to test corn planted in hills 3 feet each way, and potatoes similarly planted as a substitute for summer-fallow. The variety of corn used

is the Squaw, which is the only variety which can be relied upon to ripen each year here. In this experiment, which was only started this year, the corn planted on spring ploughed stubble yielded at the rate of 16 bushels and 20 pounds of shelled corn per acre. This is most encouraging when the severe drought conditions are considered.

Irrigated.—On the irrigated part of the Farm there are now three rotations established.

The value of using alfalfa in a rotation is well illustrated by the yields obtained in rotation U, which is a ten-year rotation consisting of six years alfalfa, one year each of hoed crop, wheat, oats, and barley. The average yield of cured hay from the six fields of alfalfa, including the field freshly seeded this year, from which no crop was obtained, was 4 tons and 168 pounds per acre. The total yield of potatoes was 598 bushels (of these, 583 bushels and 25 pounds were marketable); wheat, 63 bushels 30 pounds; oats, 107 bushels; and barley, 46 bushels. The field in which the barley was grown this year has not been in alfalfa on account of the rotation not having been established long enough, otherwise the yield would doubtless have been larger.

SOIL CULTURAL EXPERIMENTS.

The cultural investigation work started in 1911 consists of thirteen lines of experiment. Except on summer-fallow, the yields of grain were practically nil. The drought was so severe that there were no very marked differences between the various treatments given, at least none that deserves special mention.

CEREALS.

The usual variety tests of wheat, oats, barley, and peas were carried out on both the irrigated and non-irrigated land. The yields on the non-irrigated land were all relatively low. There does not appear to be much difference in the yield between Red Fife and Marquis. There is considerable interest taken in the Prelude, but as the seasons in southern Alberta are such that difficulty is rarely experienced in ripening either the Red Fife or Marquis, there would appear to be no advantage in using the Prelude, owing to its much lower yield.

FORAGE CROPS.

Corn raised for fodder did particularly well. The late rains during August brought it on rapidly. In the variety test on non-irrigated land, two of the seven varieties tested yielded at the rate of over 13 tons of fodder per acre (weighed green), and on the irrigated land North-western Dent yielded 26 tons, and two other varieties over 24 tons per acre. The maturity was good, as a few ears on one or two of the varieties ripened.

Turnips, mangels, and carrots did not give particularly good returns owing to the fact that heavy winds prevailed when the plants were coming up, and during thinning time, the result being that drifting soil destroyed many of the young plants, thus injuring the stand.

Hay on the dry land did not grow high enough to be worth cutting, except alfalfa in rows. The yield of alfalfa seed was poor.

On irrigated land the yield of hay, particularly alfalfa, was good, and the dry season made it possible to save it in excellent condition.

HORTICULTURE.

The season was quite favourable for horticultural work. A large number of apples fruited, but the total amount of fruit was not so great as last year owing probably to severe winds at blossoming time preventing the fruit setting as well as it otherwise might. The currants produced much better than usual. The raspberries did fairly well, but the strawberries yielded less than they usually do. This was attributed to a

light frost that came when the plants were in bloom. The berries were smaller than usual, and many were misshapen.

INSTALLATION OF A PUMP FOR IRRIGATION.

One of the main distributing laterals of the Canadian Pacific Railway irrigation system passes through the Station. There is a certain amount of land lying adjacent to this lateral that is too high to be irrigated by it, though nominally "below the ditch." By using a pump and lifting the water 6 to 7 feet it was possible to irrigate this land. In the spring of 1914 a 9-inch suction and 7-inch discharge rotary pump was installed. This was operated by our 20-h.p. gasoline farm engine, and proved to be quite successful. Data as to the cost of operation are being collected.

LIVE STOCK.

No breeding stock is kept on the farm up to the present time.

Winter feeding experiments were carried on with both steers and lambs.

Eighty-four head of 2- and 3-year-old steers were divided into four lots. They were all given the same amount of grain—ground barley—but different kinds of roughage. Lot I, alfalfa; lot II, alfalfa and green oat sheaves; lot III, green oat sheaves; and lot IV, dry corn fodder and alfalfa. A small profit was realized on each lot.

Four hundred and eighty head of range lambs were purchased and put on feed. They were divided into two lots, both lots receiving the same quantity of grain (mixed barley and oats in equal parts, whole) but lot I was fed alfalfa and lot II alfalfa and green oat sheaves. Lot I returned a profit of $1.04 per head, and lot II, $1.37 per head.

POULTRY AND BEES.

Work with poultry was started this year. No fowls were obtained in the spring, but eggs from the Experimental Farms at Ottawa, Agassiz, and Lacombe, as well as some purchased locally, were used for hatching. Owing to unsatisfactory quarters for the incubators and the long distance that most of the eggs had to be shipped, the percentage hatched was not very high. Over 400 chicks in all were reared. One hundred of the best pullets were saved, and 100 hens were purchased. The winter egg production was quite satisfactory. All the pullets are being carefully trap nested. During last spring and summer a very satisfactory start was made in regard to buildings for poultry work. The work for the season of 1915 is starting out quite propitiously, with a fair hatch of rather early chicks.

The man in charge of the poultry is also looking after the bees. At present we have only two colonies. Honey was extracted from one of these, the other was weak owing to the queen dying during the winter previous. The amount obtained was 100 pounds. Work along this line will be extended as soon as it is possible to increase the number of colonies.

BUILDINGS.

A six-roomed cottage for the gardener was erected during the summer. An addition connecting the implement shed to the barn was put up. This will be fitted up for a granary, and part of it will be used for a carriage room. A poultry administration building, a brooder house, and two portable colony houses were erected in connection with the poultry department.

MEETINGS AND CONVENTIONS ATTENDED.

The Superintendent attended the Western Canada Irrigation Association Convention at Penticton, B.C., and the National Irrigation Congress at Calgary, when he acted as one of the judges at the exhibition held in connection therewith. He judged the gardens for the Taber Horticultural Society, and assisted in judging at the Provincial Seed Fair. He addressed meetings on irrigation at Iron Springs, Coalhurst, Purple Springs, and Orton; addressed a meeting of the members of the local U.F.A. at Cowley and the Horticultural Society at Calgary, besides meetings at the following places in connection with the Patriotism and Production campaign: Calgary, Vulcan, Carmangay, Lethbridge, Warner, Raymond, Magrath, Pincher Creek, Stavely, High River, Gleichen, Strathmore, and Medicine Hat. He was a delegate at the organization of the Rural Development League at Olds.

VISITORS.

Each year sees an increase in the number of people who visit the Station. Among these are farmers from all parts of the southern part of the province.

METEOROLOGICAL TABLE.

Month.	Temperature F.			Precipitation.	Sunshine.
	Maximum.	Minimum.	Mean.		
1914.	°	°	°	Inches.	Hours.
April	68·1	16·0	42·4	0·54	195·2
May	79·0	21·2	51·25	0·29	318·9
June	92·0	34·1	58·4	2·48	208·5
July	93·9	40·0	67·5	0·93	386·2
August	97·0	35·4	62·08	3·59	295·0
September	86·0	31·0	52·8	1·07	221·4
October	85·5	20·1	42·88	2·17	137·6
November	66·0	— 8·0	35·7	0·63	89·8
December	42·0	—23·5	9·46	1·19	115·0
1915.					
January	52·0	—26·5	17·06	0·5	112·4
February	47·2	— 4·0	19·98	0·94	126·3
March	67·2	1·8	28·67	0·22	164·5
Total				14·55	2,370·8

EXPERIMENTAL STATION, LACOMBE, ALTA.

The season of 1914 at Lacombe was favourable for the production of general farm crops as well as fruit and vegetables. The precipitation for the months of April to August, inclusive, totaled 9·905 inches, and was ample for the needs of crops. The last spring frost occurred on May 29, but resulted in no serious injury even to fruit blossoms. The earliest frost in the fall came on September 1, and was severe enough to injure corn.

LIVE STOCK.

The horses number twenty-one, cattle ninety-four, hogs thirty-nine, and sheep nineteen.

An outbreak of black-leg occurring in the spring of 1914 resulted in the loss of seven head of cattle. This outbreak was particularly virulent and did not confine itself to young cattle, but caused the death of several breeding cows 5 years old and over. Vaccination of the entire herd was completed as quickly as possible after the disease was diagnosed, and was repeated in six months. No loss has been sustained since the first outbreak.

The feeding trials with beef and dairy cattle were of special interest. Six groups of steers were fed for beef. The primary purpose of the experiments was to test the various forms of shelter, and one group of steers was fed in the brush, one in the corral, and one in the barn. These were fed prairie hay and grain. Three other lots of steers were fed in the barn and checked against those receiving prairie hay. These three groups were fed: (1) green sheaves, (2) silage with straw, and (3) timothy hay. The conclusion reached in reference to shelter is that no buildings are necessary in order to feed steers successfully. The steers in the corral made the most economical gains, those in the brush next, and those in the barn the most expensive gains.

When comparing the results secured from the different fodders, we find that prairie hay fed in the corral stands first in economy of gains; green feed fed in the barn, second; prairie hay fed in the brush, third; prairie hay fed in the barn, fourth; ensilage and straw fed in the barn, fifth; and timothy hay fed in the barn, sixth and last.

All the cattle were sold on March 3, and when killed showed a dressed weight of almost 60 per cent off car.

Different rough fodders were fed to dairy cattle for a period of twenty weeks, in two-week periods. The results indicate strikingly the advantage of silage for the economical production of butter. Since these trials are the first, in the West at least, where an apportunity has been afforded to compare the nutritive value of oat silage with other fodders available here, the figures secured in this test, which include the entire dairy herd, should be of value to dairymen.

It is also of interest to note the daily average production of the three dairy herds at this Station.

Similar conditions surrounded the animals, and similar feeds were fed in each case, and the extremes of production shown are 3,011 pounds and 13,768 pounds. If breeding along definite lines for a few generations will bring such results as are indicated in this table, surely every breeder of dairy cattle should decide to give steady direction to his efforts towards improvement.

SWINE.

The herd of swine has now reached proportions that permit of more experimental feeding being conducted. Five groups of hogs were fed for market during the year, and the figures secured show the net profit to be 2·88 cents per pound, figuring grain at 1 cent per pound. Feeding trials have been conducted to determine the value of frosted wheat *versus* oats and barley and skim-milk, and also the best ration for pigs following weaning.

HORTICULTURE.

For the second year in succession, apples have been produced from various varieties of cross-bred apple trees. This is encouraging as it supports the expectation that if cross-bred apple trees can be carried through several successive winters, certain selections of standard apples may also be grown. To this end about 6,000 apple seedlings are being grown, and from among this number it is hoped a variety will be found which will prove both hardy and satisfactory as to size and quality.

A large amount of tree planting in the grounds has been done during the year. This planting is now having its effect on the general appearance of the Station, and

as it is now practically complete, nothing remains but to await the development of the trees and shrubs. When they have had two or three more years of growth the grounds should present a very creditable appearance.

ROTATIONS.

The rotation work is providing interesting information. The six-year rotation known as rotation "K" is giving very satisfactory results, and is being used in a modified form on the larger fields of the new farm. Here this rotation runs as follows: Hay, manure in winter, twelve tons per acre; pasture; pasture till July and August, plough 6 inches deep and fall work; wheat or oats; oats; barley and seeded down.

This rotation produced a profit last year over all operation costs of $7.60 per acre, or interest at 7 per cent on the land capitalization of over $100 per acre.

SOIL CULTURAL EXPERIMENTS.

Work in this connection is being carried on with the 500 plots as originally planned. Results now known to be of value have been secured in the "depth of ploughing" experiment, "summer-fallow," "stubble treatment," and "seeding to grasses and clover." It may also be possible when additional results have been obtained to secure informative material from other of these experiments.

POULTRY.

This Station has 253 hens, 22 ducks, 9 geese, and 22 turkeys.

Experiments have been conducted during the year as to the comparative merits of the different types of houses: First, for warmth; second, for egg production; third, as to hatchability of chicks from eggs produced therein. The results are not as yet conclusive, but indicate that the least expensive house may prove quite equal in efficiency to the more elaborate types.

BUILDINGS AND IMPROVEMENTS.

A new office building was erected which provided much-needed accommodation for the rapidly increasing office work in connection with this Station.

Over 2 miles of wire fence was erected, and alterations were made in a number of the buildings. The cattle barns were painted inside, the horse barn was sheeted inside, and the windows in the straw poultry house altered and adjusted to permit of better ventilation. A new corral was built to accommodate a larger number of feeding steers, and a number of colony houses were erected in which to winter the brood sows and to carry on feeding experiments.

FAIRS.

This Station assisted in putting on an exhibit illustrative of the work of the Experimental Farms system at the following exhibitions: Cargary, Lethbridge, Medicine Hat, Red Deer and Lacombe.

MEETINGS ATTENDED.

The Superintendent addressed a Farmer's Convention held by the Board of Trade, North Battleford. He spoke on the subjects "Grading up a Dairy Herd" and "Food Stuff available for Alberta Dairymen," at two sessions of the short course in agriculture held by the Board of Trade, Calgary. He was one of the speakers at seventeen meetings held in central Alberta in connection with the "Patriotism and Production" campaign. He spoke before the Provincial Dairymen's Association at Olds on

"Grading up a Dairy Herd." He attended a Conference of Superintendents with the officers of the Experimental Farms system in Ottawa in January. He acted as judge of cattle, sheep, and swine at the Provincial Winter Fair, Calgary, of sheep and swine at the Calgary Industrial Exhibition and of dairy cattle and swine at the Brandon Exhibition.

METEOROLOGICAL OBSERVATIONS at Lacombe, Alberta, 1914-15.

Month.	Maximum.	Minimum.	Date Maximum.	Date Minimum.	True Mean.	Precipitation.	Sunshine.
1914.	°	°			°	Inches.	Hours.
April	72·6	14·7	30th	2nd	40·1	·34	174·2
May	77·3	24·3	24th	6th	47·89	1·285	291·9
June	84·8	36·1	2nd	24th	55·81	6·07	218·7
July	87·6	39·3	3rd	29th	62·25	1·11	316·8
August	85·8	32·2	1st	31st	58·1	1·10	265·3
September	80·3	23·4	29th	16th	51·12	2·36	172·9
October	77·0	19·9	15th	22nd	47·1	·30	120·6
November	58·8	—18·1	3rd	16th	40·39	1·5	84·8
December	48·8	—19·1	17th	11th	11·3	·98	66·1
1915.							
January	40·8	—25·1	18th	26th	13·5	·295	70·0
February	42·8	— 6·6	15th	2nd	17·4	·025	109·8
March	64·8	— 1·1	22nd	4th	27·835	·075	163·9
Total	....	....	....	....	....	15·440	2055·0

EXPERIMENTAL STATION, INVERMERE, B.C.

THE SEASON.

The season of 1914-15 was on the whole an unfavourable one. The spring was backward, work did not commence on the land till April, and seeding not until the last week of the month. The continued cold weather and chilling winds prevented either field or garden crops making satisfactory progress. There was a fair amount of rain during the early summer, but August was a dry month, and much late irrigation was necessary. The irrigated plots gave satisfactory results, but the non-irrigated were only poor. Early frost in August destroyed many tender varieties in the garden. Harvesting operations were carried out in fine weather, and fall ploughing was possible up to November 7, when the last furrow was turned. The winter season has been a favourable one throughout, the land is in good condition, and the coming season promises well.

WORK CARRIED ON DURING YEAR.

The regular work in field and garden was carried on at the Station. In the department of field husbandry many of the experiments were set out with the idea of discovering to what extent irrigation is necessary, and how it is to be employed to be productive of the best results. These experiments were begun this last season, but being yet in their inception no definite data can be supplied.

A number of rotations will be given their second year's test in the coming season. These are chosen to meet the peculiar problems of the district, and are for both irrigated and dry farming. The land being deficient in humus, only fair yields were

obtained last season of either cereals or roots. It is hoped, however, to demonstrate as time goes on, how judicious treatment of the soil will materially affect its productivity.

Among the horticultural experiments, the most important, in point of view of local needs, are those dealing with potatoes, the attempt being to determine one or two kinds which can be confidently recommended to settlers in the district. Thirty-seven varieties were tested both in 1913 and 1914, and the results were singularly uniform. Another year's tests will produce more definite data, but meanwhile, taking into consideration both quality and quantity of yield, the Wee McGregor, Sir Walter Raleigh, and Late Puritan seem to be among the best. Six early varieties were also tested. Planted on April 13, they all gave good yields when harvested July 16.

The bush fruits have made satisfactory growth, and the trees in the apple orchard, which made a good start, continue to do well. It is too early yet to make any statement as to the suitability of this district for apple culture, the experiments not being yet sufficiently advanced.

Avenues of Norway maples have been planted along the road bordering the south fence of the Station, and also along the north drive, and are doing well.

LIVE STOCK.

There are at present, on the Station, one heavy team for the regular work of the farm, one general-purpose horse, two milch cows, which give a sufficient supply of milk for all employed on the Station, and two steers which have been recently purchased to conduct feeding experiments with roots produced last season.

POULTRY AND BEES.

There are now four pens of poultry, one each of Barred Rock and Light Sussex, and two pens of White Leghorn. The birds have come through the winter well, and have given fair returns in eggs.

The incubators are now running, and the birds have been removed from their winter location, near the stables, to the large runs on the land to the west of the farm proper, on the slope of Tobey Creek. The three colonies of bees survived the winter. One was placed in the cellar and the others remained outside. They have now been removed to the new poultry runs.

BUILDINGS AND IMPROVEMENTS.

A convenient implement and tool house, 24 feet by 36 feet, has been erected on the Station, and a roothouse and storeroom, which also provides accommodation for the incubators and for testing eggs, has been built on the poultry grounds. An addition of two new poultry-houses has also been made.

The roads on the Station have been changed, in order to use the land to better advantage, and the main driveway now enters the Station grounds from the south, and a road runs east and west from the stables, across the northern part of the farm.

On September 7, the Dominion Cerealist visited the Station, and chose a tract of land in the southwestern part of the Station inclosure where a number of cereal tests will be commenced this season.

During the season the Superintendent has visited a large number of the farmers of the district who were anxious to obtain advice on some problem connected with the management of their farms. He also visited the Cranbrook Farmers' Institute meeting in January, and took part in the discussion there of "Marketing Problems" and "The Rotation of Crops." Now that the railway service has been extended through Invermere he expects to be able to do more along these lines.

Addition has been made to the stock of implements at the Station, by the purchase of a pulverizer, a hay carrier, and a reaping attachment for a mower.

METEOROLOGICAL REPORT.

Month.	Highest Temperature.		Lowest Temperature.		Total Precipitation.	Bright Sunshine.
1914.	Date.	°	Date.	°	Inches.	Hours.
April	30th	71	1st	22	1·25	165·1
May	16th	87	6th	28	1·46	237·1
June	18th	85	6th	34	1·59	98·4
July	31st	95	16th	42	1·57	314·5
August	1st	95	31st	33	·75	267·9
September	2nd	80	30th	33	2·16	148·3
October	16th	66	22nd	24	·77	86·7
November	25th	51	15th	3	·79	56·4
December	2nd	35	15th	—16	·42	86·8
1915.						
January	11th	36	21st	—15	·51	46·0
February	17th	44	14th	— 1	·30	70·9
March	21st	63	26th	12	·03	175·8
Totals					11·60	1853·9

EXPERIMENTAL FARM, AGASSIZ, B.C.

THE SEASON.

The season of 1914 was a good one for crop production. The total rainfall was considerably below that of the previous year, but was more favourably distributed. Seeding operations were begun in good time in April. July and August were very dry, only ·75 inches of rain falling in the two months. Heavy rain fell in October and through November, which made the harvesting of roots and corn somewhat more difficult. The winter was very mild; no snow has fallen during the entire year.

METEOROLOGICAL TABLE.

Months.	Maximum Temperature.		Minimum Temperature.		Mean Temp.	Total Precipitation.			
						Rain.		Sunshine.	
1914.	Date.	°	Date.	°	°	Inches.	Days.	Hours.	Mins.
April	21	72	1	31	51·55	2·94	28	143	54
May	22, 15	85	4	36	56·28	3·55	24	202	
June	15	87	4	39	52·91	5·18	26	176	18
July	17	87	6	40	62·075	·15	27	246	54
August	19	87	3	44	62·995	·60	28	224	30
September	23	78	25, 27, 30	40	52·33	6·29	18	60	30
October	15	71	4	34	50·4	7·53	24	111	30
November	1, 28	52	16	28	42·6	14·72	13	36	18
December	2, 8	49	21	16	35·235	·53	21	80	18
1915.									
January	20	53	26	16	37·065	7·17	17	69	30
February	20	55	14, 19, 26	28	41·02	5·67	23	69	30
March	21	73	9, 19	30	48·11	2·45	26	131	24
Totals						56·78	275	1552	36

The following crops were grown for stock-feeding:—

	Tons.	Lbs.
Corn silage	211	710
Clover silage	124	
Mangels	84	1,450
Turnips	6	155
Carrots	3	1,520
Sugar beets	....	1,820
Potatoes	9	1,200
Mixed grains	15	753
Barley	1	356
Oats	1	782
Peas	....	1,200
Clover hay	82	800

A large block of land has been carefully prepared for permanent cultural and fertilizer experiments, and has been divided into 205 plots. Part of these will be devoted to a four-year rotation, the rest to experiments with the various fertilizers, natural and artificial. This land has been under preparation since 1911, and is now in fit condition for experimental work.

A considerable amount of labour has been devoted to fencing and draining. Nineteen hundred feet of new fence has been erected. The main ditch at the back of the Farm has been cleaned out and put into good condition.

Some 14 acres of land have been cleared and prepared for crop. The figures on the cost of these operations and the methods employed are useful, and will be found in the special report on Field Husbandry.

During the whole year the force of working horses has been kept busy, either at the ordinary field work or at fencing, land clearing, etc. Work horses alone are kept on this Farm, so there is no experimental work to report. Figures have been collected, however, on the cost of keep of heavy and light draught horses. Two of the old horses, which were worn out, were destroyed, and three heavy draught colts were purchased at the close of the year.

With the Holstein-Friesian herd, the breeding work has been continued with the same objects as hitherto. Some of the older grade cows have been culled out, as falling below the improved standard of the herd. As a result of the high prices of food, the profit per cow was low as compared with last year, though the yield was a little larger. Of the calves born, 68 per cent were heifers, as compared to 50 per cent last year. The cows have kept healthy, and there have been no losses from death.

Some feeding experiments were conducted with the object of testing the relative values of certain foods for cows and calves; also with clover silage for dairy cattle. The results of these will be found in the special report on dairy cattle for this Farm.

In the breeding herd of Yorkshire hogs there are now thirty-three head: two stock boars, twenty-five mature sows, and six young sows. The performance of the sows was quite up to standard, and the litters produced were strong and healthy.

Figures were collected on the cost of up-keep of boars (aged and young) for one year, and also the cost of raising young brood sows to one year of age. Since the price of foods is relatively high, these figures should constitute a safe estimate.

Last year some experimental work on rice meal, as a food for swine, was reported. The work has been continued on a large scale this year, with good success. It would appear from the results of a large number of trials, that the injurious effects of rice meal can be counteracted by the addition of phosphorus to the ration.

The flock of Dorset Horned sheep has shown considerable improvement in performance during the past year, following the severe culling and the addition of new blood in the shape of an imported ram. Lambing is at present in progress and so far the ewes have given 200 per cent lambs, all of which are strong and healthy.

The poultry work has been increased, and some useful results have been obtained in the experimental work. As heretofore, only two breeds of fowls have been kept, viz.:

Barred Plymouth Rocks and White Leghorns. In addition to these, however, a start has been made with ducks and some homer pigeons have been secured, with the object of raising squabs.

The farm dairy has been enlarged and repaired, and the facilities for cheese making improved. The work is in charge of Miss R. Keene. The number of outside samples sent in for testing has greatly increased during the year.

In the variety tests of cereals the following general results were obtained: Wheat, owing to the previous destruction of the crop by the "wheat midge" was discontinued. It appears, however, that the insect migrated to the barley in sufficient numbers to perpetuate the species.

Of the fifteen varieties of oats tested, Gold Rain gave the highest yield this year. Eighty Day was the earliest maturing, but the lighest yielder. Six varieties of two-row barley and eight varieties of six-row barley were tested. The yields were higher than last year. Of the two-row barley, Danish Chevalier came first, and Beaver second. Of the six-row, Trooper and Odessa headed the list.

Nine varieties of peas were grown, and though short in straw, produced an average crop of grain. The highest yielding variety was Solo, with 53 bushels per acre. Golden Vine and Prussian Blue were second and third, respectively.

The horticultural work, in charge of Mr. J. D. Brydon, consisted of an extensive series of variety tests with vegetables, the care of the young orchard of 4 acres, the variety testing of flowers and bulbs, and the care of the lawns and garden. Some useful notes were made on the ornamental trees and shrubs, of which there are a great number on this Farm.

The work in apiculture has been facilitated by the erection of a small bee-house and yard. This year, seven hives produced 375 pounds of honey, an average of 53·5 pounds per hive.

In the course of the year, 485 samples of potatoes were distributed. Of these, 265 or 54 per cent were reported on. Of the results obtained, 78 per cent were reported clean.

EXPERIMENTAL STATION, SIDNEY, B.C.

The spring season commenced early in April with fine weather and light showers of rain which gave promise of a good growing season, but on account of cool nights in April, May, and June, with fogs in the morning and only 0·27 inch rainfall during the months of July and August, results were on the whole only fairly satisfactory and some cereals sown the first week in June had to be cut in September for green feed.

The general harvesting was finished on August 12; threshing and baling straw was done in September. The samples of grains harvested and threshed were well up to standard, the yield being a fair average, considering the very dry season.

During the month of October, field roots and potatoes were lifted and pitted for storage (not for frost protection).

Seventeen varieties of potatoes were planted in October for a winter experiment, and on March 31, 1915, they all showed good growth.

Arlington Awnless barley and Thousandfold rye, sown in the month of November, were in full ear on March 31, 1915; red and crimson clover, sainfoin, alfalfa and swiss chard sown at the same time are a good catch. These all being now two years old here, demonstrate with other experiments in horticulture that acclimatized seeds are fully fourteen days in advance of new imports.

The temperature during the month of March, 1915, was very even, showing a variation from maximum to minimum of only 29 degrees. These conditions called for early spraying. Early plums, peaches, a few cherries and pear trees commenced to bloom March 15.

During the months of July and September, many visitors and societies visited the Station, their interest having been stirred by seeing and hearing of the good collection sent by the Experimental Station for Vancouver Island to the Vancouver Exhibition to supplement the exhibit from the Central Experimental Farm at Ottawa.

METEOROLOGICAL RECORDS.

Month.	Temperature.			Rainfall.	Sunshine.	
	Highest.	Lowest.	Mean.			
1914.	°	°	°	Inches.	Hours.	Mins.
April	68	34	50·38	1·63	172	
May	82	40	56·	·28	293	
June	83	38·5	58·50	2·14	281	4
July	85·5	44	64·23	·13	342	
August	83·5	46	62·36	·14	300	2
September	72	41·5	54·07	1·97	87	4
October	66	39	51·90	3·63	94	4
November	56	32	46·30	8·20	46	30
December	41·6	34	37·80	1·21	72	56
1915.						
January	49	27·5	38·50	2·77	70	4
February	51	31	41·60	1·66	65	9
March	64	35	47·	1·65	142	42
	....	....	....	25·41	....	

DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE DIVISION OF CHEMISTRY

For the Year ending March 31, 1915

PREPARED BY

Dominion Chemist. - - - - - - - - - Frank T. Shutt, M.A., D.Sc., F.I.C., F.R.S.C.

REPORT OF THE DIVISION OF CHEMISTRY

FRANK T. SHUTT, M.A., D.Sc., F.I.C., F.R.S.C.

DOMINION CHEMIST.

OTTAWA, March 31, 1915.

J. H. GRISDALE, Esq., B.Agr.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit, herewith, the twenty-eighth Annual Report of the Division of Chemistry of the Dominion Experimental Farms.

Circumstances of a peculiar and very trying nature, arising largely from the outbreak of the European war, have, during the past year—and more especially during the last six months—very seriously interfered with the progress of the work of the Division. Enlistments for Active Service and resignations among the members of the chemical staff followed in quick succession in the early autumn months of 1914, so that long before the close of the year but one of the five assistant chemists remained at his post. Every effort was made to fill the vacancies as quickly as possible, but considerable difficulty was experienced in finding suitable men, and despite our best endeavours many weeks—several months, indeed—elapsed before the staff was brought up to its previous force. Indeed, several of those appointed to take the places of those who had left for the front resigned within a few weeks of their engagement, in order to enlist for service, and, at the time of writing, the staff is considerably below its normal strength.

Further, our usual work has been interrupted by the undertaking of certain special investigations brought into prominence or made necessary by present war conditions, as, for instance, the preparation of potassic fertilizers from seaweed and other native sources of potash.

The "Patriotism and Production" campaign, conducted throughout the Dominion in the early months of 1915 also made its demands upon our time, in the writing of special bulletins and articles and in replying to the numerous inquiries sent in as a result of this effort toward better and more profitable farming in Canada. In this connection, it is very satisfactory to note that this campaign appears to have been very successful in awakening throughout the country a lively interest in many matters pertaining to a larger and more economical production of crops and farm produce in general.

These matters are mentioned here chiefly for the reason that at the present time there is a large accumulation, both of letters and samples, awaiting our attention. For months past it has been quite impossible to keep pace with the many demands made upon us, and we must therefore ask the exercise of patience on the part of our correspondents, assuring them that every possible effort will be made to meet their wishes. As far as may be practicable, the samples sent in for examination and report are taken in hand in the order in which they are received. As every sample is duly registered, on its arrival, in the books of the Division, neglect through oversight is not likely to occur.

SAMPLES received for Examination and Report for twelve months ending March 31, 1915.

Sample.	British Columbia.	Alberta.	Saskatchewan.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	P. E. Island.	Total.
Soils	82	1,009	389	462	91	68	23	23	11	2,15
Muds, mucks, and marls	1	......	......	......	5	9	4	3	12	34
Manures and fertilizers	23	2	......	......	19	19	10	10	4	87
Forage plants and fodders, feeding stuffs	20	21	17	6	129	43	3	11	7	257
Waters	29	29	36	6	186	31	13	5	1	336
Insecticides and fungicides	......	......	1	......	25	......	......	......	......	26
Miscellaneous	40	7	9	5	779	81	4	4	2	931
										3,829

The total number, 3,829, exceeds by more than 1,000 the number of samples of the previous year—an indication of the increase of the work in this branch of the Division's activities and of the growing appreciation on the part of our farmers of the assistance that may be obtained from chemical research.

Conservation of Soil Moisture.—We have continued the investigation begun in 1912 on certain of the branch Farms and Stations in the Canadian Northwest, to learn the influence of various cultural methods and systems of cropping upon the moisture content of the soil. On the plots under experiment, soil samples are taken at certain intervals throughout the growing season and forwarded to the laboratories at Ottawa for their moisture determination. From 200 to 300 are analyzed in this respect monthly. The samples are collected at such depths that the results may indicate the available moisture throughout the soil to a depth of 6 feet.

This investigation is still in progress, but it has already afforded evidence of the importance of early and fairly deep ploughing of summer-fallows, of the subsurface packing of light soils and of frequent cultivation of fallows in checking surface evaporation.

Soils from the C. P. R. Irrigation Tract in Alberta.—This work has been undertaken for the Irrigation Branch of the Department of the Interior, and has for its object the giving of assistance to the engineers who are engaged in the reclassification of the lands of this section. It has added much to our knowledge of the soils of Alberta and their suitability for farming under irrigation. It has also assisted in defining such areas as may be too heavily impregnated with alkali for agricultural operations. About fifty groups of soil, each consisting of three to seven members, have been examined and reported on as to fertility and alkali content during the year.

Fertilizer from Seaweed.—For many years the Stassfurt (Germany) mines have furnished all the potash compounds used for fertilizing purposes. The supply from this source was entirely cut off at the outbreak of the European war, and the question of finding some home source of potash to supply the deficiency immediately became one of vital interest to Canadian agriculture. Among the inquiries that we have made to that end is the utilization of the seaweeds that occur in abundance upon the Atlantic and Pacific seaboards.

The manurial value of seaweeds, especially in the potash and nitrogen they contain, has frequently been pointed out in the reports of this Division. Indeed at the time the

war broke out, the analysis of an extensive series of seaweeds collected on the Pacific coast through the kindness of the Dominion Biological Board, was in progress. Seaweeds differ greatly in composition and especially in potash content, according to variety, time of year at which they are collected, etc. Our investigation has shown that many varieties found on our seaboards are of very considerable value for fertilizing purposes.

Through the courtesy of the Department of Naval Service, the Dogfish Reduction Works at Clarke's Harbour, N.S., has been placed at our disposal for several months, to enable us to make a practical trial in the preparation of dried ground seaweed for use as a fertilizer. A preliminary survey of the district has been made as to the possibility of a supply of the fresh seaweed, and steps taken to obtain suitable machinery for cutting and grinding the material. At the time of writing the matter has so far progressed as to enable the writer to say that the prospects are very fairly good for the success of the undertaking, and that a material in a convenient form for application may be economically prepared which will furnish appreciable amounts of potash and nitrogen in forms that may become more or less readily available for crop use.

The Influence of Environment on the Composition of Wheat.—This investigation, begun in 1905, has been continued. It has shown that climatic or seasonal conditions may profoundly modify the protein content of the grain. Wheat from the same stock is sown on the Farms and Stations of the Experimental Farm system throughout the Dominion, and the harvested product analyzed. The results are studied in the light of the information supplied by the several Superintendents as to character of the season, soil, etc., taken from notes made in the field. It would appear that the conditions conducive to a hard berry with a high gluten content are a moderately dry soil and fairly high temperatures during that period in which the kernel is filling out.

Unfortunately, due to pressure of other work, the analytical data from the 1914 crop have not at the time of writing been obtained. We expect to record and discuss them with the results of 1915.

The value of our results in the work will in the future be greatly enhanced through the co-operation of the Meteorological Service, which has kindly undertaken the tabulation of the weather statistics at the various points at which we are conducting this investigation and the correlation of these data with the figures for the growth and yields of the wheat on the several plots.

Experiments with Fertilizers.—Our work with fertilizers at Fredericton, N.B., and Kentville, N.S., has been continued, and it is of interest to note that the results of 1914 confirm, in the main, those previously obtained. For potatoes, on soil in fair condition, the most profitable results have been from moderate rather than heavy dressings of a "complete" fertilizer. Fertilizer materials containing but one or two of the elements of fertility as a rule have not given as profitable returns as those furnishing all three elements. Further, the largest yields have not always given the largest profits, which, for the purposes of the investigation, may be considered as the value of the increased yield over that of the unfertilized area less the cost of the fertilizer.

It is with pleasure that we can report that the details for further investigational work with fertilizers on systematic and scientific lines have been perfected. It is confidently expected that this new experimental work will be started this spring (1915) at the Experimental Stations at Charlottetown, P.E.I., Kentville, N.S., Fredericton, N.B., and Agassiz, B.C. Preparations are also being made, by cropping and testing suitable areas, at the Stations at Cap Rouge, Que., Lennoxville, Que., and Sidney, B.C., for the inauguration of similar experiments in 1916.

Considerable interest has been awakened in Eastern Canada and in British Columbia during the past year in the matter of lime and ground limestone for the

improvement of soils. We have in consequence issued a special bulletin on the subject under the title of "Lime in Agriculture" (No. 80, Experimental Farm Series). This bulletin, copies of which are still available, deals in a popular and succinct manner with all the more important phases of the subject. A number of samples of lime and limestone have been sent in for examination and report, and these, as far as time permitted, have been submitted to analysis. The data of these are now recorded; they will prove of value for the purposes of reference.

An experiment in liming has been carried out with the assistance of the Superintendent of the Experimental Station, Cap Rouge, Que. The results on the whole have been most gratifying, and the attention of our readers who are interested in this important subject is directed to the chapter. It furnishes an excellent illustration of the value of the application of lime to a soil deficient in this element.

Fodders and Feeding Stuffs.—The larger number of the "feeds" analyzed are from stock used in feeding experiments with dairy cows, sheep, and swine, conducted by the Division of Animal Husbandry at the Central Farm, Ottawa. The results will prove of value to those studying these experiments, and also to others who may be purchasing these feeds. In these days of high prices of nearly all classes of mill feeds and milling products, it is important for true economy that the farmer should be able to compare the feeds offered, not only as to price per ton but also as to composition, more particularly as to protein and fat content.

The chapter also includes the analyses of certain forage crops used in feeding experiments at the branch farms, together with data of certain feeds of a more or less miscellaneous character submitted to us for a report as to their nutritive character. These should prove of considerable interest to dairymen, stock raisers, and indeed to all farmers, for the economic feeding of stock merits closer attention than it has generally received in the past.

Sugar Beets.—Evidence of a very satisfactory character has been obtained as to the suitability of soil and climatic conditions in many widely distant points in the Dominion for the production of sugar beets for factory purposes. This is a continuation of an investigation that has been carried on for a number of years. The varieties tested on the branch Farms and Stations were, as heretofore, Vilmorin's Improved A and B, Klein Wanzleben, and Très Riche, the seed being obtained from Messrs. Vilmorin, Andrieux et Cie., Paris, France. The results of our work are increasingly valuable as the years go by in indicating the possibilities of Canada as a sugar producing country.

Field Roots.—As for a number of years past, analysis has been made of the principal varieties of mangels, turnips, and carrots grown on the Central Farm, Ottawa. The results serve as an indication of their comparative nutritive values.

The question of heredity as related to composition in mangels has also received attention. This study, now in its fifteenth year, has shown that the Gate Post is invariably richer in dry matter and sugar than the Giant Yellow Globe, the two varieties that have been annually examined in this investigation.

Well Waters.—We have continued the work in connection with the examination of the water supplies of farm homesteads. Much interest in this matter is being evinced by our farmers, and it is gratifying to note from year to year the increasing number of applicants for advice and an examination of their well water. Undoubtedly this is a vital subject, the importance of which it is difficult to overestimate. As we have frequently remarked, there is no more valuable asset on the farm than an ample supply of pure water, and we have reason to believe that the number of farmers accepting this statement and acting upon it, is steadily increasing. Nevertheless there is yet much to be done in this useful propaganda, for on too many farms to-day the water is obtained from shallow wells, dangerously located as regards pollution.

The number of samples submitted to complete analysis during the year was 195, of which forty-nine were pronounced pure and wholesome, fifty-four as highly suspicious and probably dangerous, thirty-six as very seriously polluted, and fifty-six as non-potable by reason of high salinity.

Meat Inspection Division.—This work consists in the examination of samples collected by the inspectors of the Meat Inspection Division, Health of Animals' Branch, Department of Agriculture, at the various packing houses and fruit and vegetable canneries throughout the Dominion. These samples comprise dye stuffs, preservatives, pickling solutions, spices and condiments, preserved meats, evaporated apples, etc. The reports from this work are submitted to the Veterinary Director-General.

In the following table we give a classification of the samples examined during the year ending March 31, 1915.

SAMPLES received from Meat Inspection Division for Examination for Year 1914-15.

Nature of Sample.	Number Received.
Lards, tallows, oils and butters	13
Preserved meats, sausages, mince meat, etc	123
Colouring and dye stuffs	147
Preservatives	145
Pickling solutions	50
Spices and condiments	129
Evaporated apples and waste	26
Miscellaneous, etc	29
	662

This work, which yearly increases in volume, necessitates a very considerable amount of skilful, careful analysis. In many instances it has been found necessary to devise special analytical methods, and this naturally means much time consumed in research.

Fertilizing Value of Rain and Snow.—The data for the eighth year of this investigation are recorded. During the year ending February 28, 1915, there were furnished from these sources for the enrichment of the soil, 4·905 pounds of available nitrogen per acre. The average amount for the past eight years, per annum, is 6·023 pounds per acre.

The Staff.—The resignation of Mr. A. T. Charron, M.A., first assistant chemist since July 1, 1898, was tendered, and accepted with much regret, on August 31, 1914. For more than sixteen years Mr. Charron performed much faithful and good work in assisting with the correspondence and lecturing in French on agricultural subjects, and in the general analytical work of the laboratories. Mr. Charron's practical acquaintance with farming operations, coupled with his analytical skill and technical knowledge in the chemistry of soils, manures, feeding stuffs, and other agricultural matters, made his services peculiarly valuable to the Division. In all his duties Mr. Charron proved an efficient and obliging assistant, and I was very sorry to lose so earnest and valuable a co-worker.

Mr. C. H. Robinson, B.A., has continued in charge of the examination of the meat inspection samples, and has also done excellent work in a number of the investigations carried out by the Division. As the sole remaining member of the staff of assistants present with us at the outbreak of the war, a large share of the general analytical work of the laboratory has fallen upon Mr. Robinson during the past year.

Mr. A. T. Stuart, B.A., was granted a year's leave of absence from March 1, 1915. In addition to water analysis, nitrogen determination, etc., Mr. Stuart assisted in the

planning and carrying out of the experiments with fertilizers on the branch Farms and Stations, and in this work has shown a special aptitude. His position on the staff has been temporarily filled by the appointment of Mr. C. W. Graham, B.A., who is doing good work.

Mr. J. T. Janson, B.Sc., who was appointed in July, 1913, was granted leave to enlist for active military service in August, 1914, when he immediately left to rejoin his regiment in England.

Mr. J. M. Scott, M.Sc., appointed in March, 1914, resigned his position in August of that year to accept a post on the staff of the Normal School, Truro, N.S.

Mr. G. N. Kennedy, B.A., appointed January 1, 1915, resigned February 15, 1915, to enlist for active military service.

Mr. L. Aitchison Browne, B.Sc. (Edin.), was appointed assistant chemist on the staff, January 15, 1915, and has already proved himself a careful and accurate analyst and a faithful worker.

The assistants engaged for the Department of the Interior in the analyses of the soils from the C.P.R. Irrigation Tract, Alberta, during the year have included Messrs. W. S. Funnell, H. S. Heustis, C. R. Rubidge, and L. L. Bolton. At the time of writing Mr. Rubidge is alone in the conduct of the work.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,

Dominion Chemist.

FERTILIZER EXPERIMENTS.

The experimental work with fertilizers inaugurated in 1913 at Fredericton, N.B., and Kentville, N.S., the results of which were discussed in last year's report, has been continued, and we can now record the data obtained from the second season's operations. The writer is indebted to Mr. W. W. Hubbard, Superintendent of the Experimental Station at Fredericton, N.B., and to Mr. W. Saxby Blair, Superintendent at Kentville, N.S., under whose control the field work has been carried on, for the tabulated data included in this report. The writer further wishes to place on record his thanks for the valuable assistance and hearty co-operation which these gentlemen have given him in the prosecution of this important investigation.

Experiment I.

To ascertain the relative efficiency of several forms of nitrogen (including fish scrap) and of phosphoric acid in formula 4:8:10. Potatoes and Oats.

This experiment was planned more especially to ascertain the merits of dogfish scrap as a source of nitrogen, but the scheme also included trials with other forms of nitrogen, as in nitrate of soda and sulphate of ammonia, and further permitted of a comparison of the value of phosphoric acid as furnished by superphosphate and basic slag. To ascertain the residual effects of the various fertilizers, a three years' rotation of potatoes, grain, and clover will be followed.

The work was carried on both at Fredericton, N.B., and Kentville, N.S.

At Fredericton the experiment was conducted in duplicate. The area comprised eighteen plots, each of one-tenth acre, two of which were used as checks. The land was somewhat heavy and had been in sod; it was spring ploughed and thoroughly prepared. The test was made with potatoes, the varieties Delaware, Green Mountain, and Irish Cobbler being planted in equal quantities on each plot.

At Kentville, the land on which this experiment was carried on had been cleared of green stumps in 1912. It was seeded to buckwheat in 1913, which had been ploughed under. In 1914 the soil was ploughed and thoroughly worked and planted with apple trees, set 20 by 40 feet apart. The space between the trees was utilized for this experiment, the plots being 96·8 feet long and 30 feet wide or one-fifteenth of an acre each. The fertilizer was broadcasted on the prepared soil, before planting, and harrowed in. The whole area was sown to Ligowo oats, to within 3 feet of the trees, the strips on either side of the trees being cultivated throughout the season. The oats were sown by drill on June 2, and the crop harvested September 10. The growth on the plots was fairly uniform except upon the check plots, on which the straw was shorter.

At both Stations the several ingredients were mixed for each plot in such proportions as to make a fertilizer represented by the formula 4:8:10. These mixtures were applied in such amounts as would be equivalent to dressings at the rate of 500, 750, and 1,000 pounds per acre, as indicated in the table of data.

Table I is largely self explanatory, recording the several amounts of the various fertilizer ingredients applied to the plots and the yields of potatoes at Fredericton and of oats at Kentville obtained, as calculated per acre.

TABLE I.—RELATIVE EFFICIENCY of several forms of Nitrogen (including fish scrap) and Phosphoric Acid, in Formula 4:8:10. Potatoes and Oats.

Plot.	Nitrate of Soda.	Sulphate of Ammonia.	Fish Scrap.	Superphosphate.	Basic Slag.	Muriate of Potash.	Fertilizer, 4:8:10, lb. per acre.	Fredericton, N.B. (Potatoes). Duplicate.		Fredericton, N.B. (Potatoes). Average	Kentville, N.S. (Oats). Straw. Duplicates		Kentville, N.S. (Oats). Straw. Average	Kentville, N.S. (Oats). Grain. Duplicates.		Kentville, N.S. (Oats). Grain. Average
	lb.	lb.	lb.	lb.	lb.	lb.		bush.lb.	bush.lb.	bush.lb.	lb.	lb.	lb.	bush.lb.	bush.lb.	bush.lb.
1	62·5	50	...	266·5	...	100	500	222–40	274	248–20	2,715	2,797·5	2,756·2	51–6	61–1	56–3½
2	62·5	50	...	...	266·5	100	500	227	231–20	229–10	2,962·5	2,460	2,711·2	54–1½	51–6	52–20
3	...	...	215	233·5	...	100	500	254–40	211	232–50	2,505	2,527·5	2,516·2	56–16	58–0½	57–8
4 *	...	...	215	233·5	...	100	500	...	...	...	2,700	2,550	2,625	66–6	66–6	66–6
5	...	...	215	...	233·5	100	500	251	230–40	240–50	2,212·5	2,377·5	2,295	54–½	58–0⅓	56–1
6	31	25	10	117	116	100	500	256	327–20	291–20	3,045	2,797·5	2,921·2	63–18	54–16	59
7	94	75	...	...	400	150	750	195	320	257–50	3,157·5	3,007·5	3,082·5	52–24½	52–24½	52–24½
8	...	...	323	...	350	150	750	242–40	242	242–20	2,992·5	2,760	2,876·2	61–33½	59–4	60–18
9	...	...	430	...	467	200	1,000	...	...	...	3,307·5	2,820	3,063·7	68–5	60–15	64–10
10	...	...	430	467	...	200	1,000	...	...	...	2,737·5	2,610	2,673·7	67–9	64–14	65–28
11	125	100	...	533	...	200	1,000	...	...	...	3,120	3,307·5	3,213·7	60–15	61–18½	60–34
12	62	50	216	234	232	200	1,000	292	331–40	311–50	...	...	...	43–8	...	...
13. No fertilizer	...	...	...	...	...	...	...	135·40	175–20	155–30	1,702·5	1,680	1,787·4	46–33	45–30	45–12
Average of plots fertilized	...	...	...	...	...	...	...	...	...	256–51	...	...	2,794	...	...	59–3
Average of plots not fertilized	...	...	...	...	...	...	...	...	...	155–30	...	...	1,787·4	...	...	45–12

* Limed at the rate of 2,000 pounds per acre.

DISCUSSION OF RESULTS.

(1) The fertilizers applied gave in every instance an increased yield, that is, a yield over and above the yields from the check (unfertilized) plots. This is true alike for both potatoes and oats, the maximum increase being practically 100 per cent in potatoes and 50 per cent in oats.

(2) These increased yields, however, bear very little relation to the amounts of the fertilizer applied. The very heavy dressings, at the rate of 1,000 pounds per acre, have not, in the larger number of instances, given yields in excess of those from 500 pounds, and we are quite safe in saying that the results of these experiments point to an application of the latter amount as far more profitable than heavier dressings. In no case has the return from the application of 750 and 1,000 pounds been such as to warrant the increased expenditure of fertilizer.

(3) Remembering that, in experiments of this character, it is not advisable or safe to make deductions as to the relative efficiency of any particular fertilizer when the yields do not differ to a degree of more than 10 per cent from the general average, the constancy or close agreement of the averages of yields from the fertilized plots is significant. The average yield from the fertilized plots of potatoes is 257 bushels, the limits being 229 and 311; and of oats, 59 bushels, with limits of 52 and 66.

It would seem, therefore, that the maximum possibilities, under the conditions of soil and season obtaining, had practically been attained by an application of 500 pounds per acre.

(4) For the potato crop, the results from plots 6 and 12 indicate an advantage in furnishing the fertilizing elements in a mixture of various forms and, though not conclusive, the liming of the land at Kentville for oats has been beneficial.

(5) The value of dogfish scrap as a source of nitrogen, both for potatoes and oats, has been established. It is possible that in the succeeding years of the rotation, this material may give still further evidence of its efficiency, as it is not probable that more than one-third or one-half of its nitrogen becomes available the year of its application.

(6) This experiment has not afforded any emphatic evidence as to the relative merits of the various forms of nitrogen and phosphoric acid employed, probably by reason of the fact already referred to, that 500 pounds, the lowest application made, has afforded the maximum of plant food usable by the crops under the conditions of soil and season that obtained.

(7) It would seem probable that an application of less than 500 pounds per acre, say 350 or 400 pounds, might have given a more profitable return on both crops.

(8) The experiment has not afforded any data to support the view widely held in the Maritime Provinces that a fertilizer of the formula 4:8:10 is the best for potatoes, and previous work has indicated that such a fertilizer is unnecessarily high in potash.

EXPERIMENT II.

To ascertain the Influence of Fertilizer Residues on the Crop of the Second Season. Potatoes.

This experiment, conducted at Fredericton, N.B., consisted in again planting with potatoes the fertilized plots of 1913, but without any further application of fertilizer, the object being to ascertain what effect the residues of the fertilizers of the preceding year might have on the succeeding crop. Unfortunately, several of the most interesting of the plots of the series had to be dispensed with in 1914, owing to a re-arrangement of the land and fencing.

For the purposes of comparison, the yields for 1913 are included in the table of data.

TABLE II.—Influence of Fertilizer Residues on Crop of the Second Season. Fredericton, N.B. Potatoes.

Plot.	Nitrate of Soda.	Sulphate of Ammonia.	Super-phosphate	Basic Slag.	Bone Meal.	Sulphate of Potash.	Lime.	Yield per Acre.	
								1913 Fertilized	1914 no additional Fertilizer
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Bush.	Bush.
A	75	75	250		250	150		322	
B	75	75		500		150		311	241
C	150							200	198
D		120						224	55
E								176	155·5
F			350					172	118
G				500				148	107
H						150		220	139
I	75	75	350					172	117·5
J	75	75		500				160	98
K								134	
L	75	75				150		241	150
M			350			150		227	79
N				500		150		125	110
O							2,000	199	
P	75	50	50	200		100		315	
Q	75	50	50	200		60		320	
R	75	50	50	200		30		299	
S								192	

The check plots are E., K., and S.

DISCUSSION OF RESULTS.

(1) The yields generally throughout the series are much lower than those of 1913, probably in large part due to the season of 1914 being less favourable for the potato crop.

(2) The residual effect of the fertilizers on the larger number of the plots is nil or negligible. One marked exception to this conclusion stands out, namely, plot B; and it is significant that this is the only plot of the series cropped in 1914 that had been treated with a complete fertilizer. The value of this increase, at least $20 per acre, should be added to the profits of 1913 on this plot.

EXPERIMENT III.

To ascertain the Value of applying Fertilizer to each Crop of the Rotation. Second Year: Oats.

This experiment, carried on at Kentville, N.S., is a continuation of the fertilizer work on the plots used at that Station in 1913, when the crop was potatoes.

The results now recorded, for the season of 1914, are for oats. The fertilizer scheme (see Table III) is identical with that of 1913. The several mixtures were broadcasted in the spring of 1914 before seeding, and harrowed in. The variety of oats employed was Abundance, sown at the rate of 2½ bushels per acre, together with common red clover 8 pounds, alsike clover 2 pounds, and timothy 8 pounds per acre.

It will be observed that this experiment differs essentially from Experiment II. in that the fertilizer treatment was repeated in 1914 for the second crop of the rotation. At Fredericton (Experiment II.) the second crop was grown without any additional fertilizer.

The data for this experiment are given in table III, which also furnishes information as to the value of the yield of each plot at 60 cents per bushel, the cost of the fertilizer, the net receipts per plot, and the profit (or loss) for each plot after deducting the cost of fertilizer.

TABLE III.—Results from applying Fertilizer to each Crop of the Rotation, Kentville, N.S. Second Year: Oats.

Plot.	Nitrate of Soda.	Sulphate of Ammonia.	Super-phosphate.	Basic Slag.	Bone Meal.	Sulphate of Potash.	Straw.	Grain.		Grain at 60c. per bush.	Cost of Fertilizer.	Net Receipts.	Profit over no Fertilizer. ($17.60)
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	bush.	-lb.	$ cts.	$ cts.	$ cts.	$ cts.
1	150		350			150	2,135	54	29	32 70	12 28	20 42	2 82
2	150			500		150	2,160	48	8	28·88	12·53	16·35	−1 25
3	150				500	150	2,200	58	28	35·08	15·78	19·30	1 70
4		150	350			150	2,780	62	2	37·22	12·28	24·94	7·34
5	150		350			100	2,095	53	18	31·98	10·98	21·00	3·40
6							1,280	30		18·10		18 00	
7[1]	150		350			150	2,160	48	8	34·88	7·56	27·32	9·72
8[2]	150		350			150	2,320	61	6	36·66	11·33	25·33	7·73
9	150		350			60	2,460	54	4	32·44	9·93	22·51	4·91
10	150						1,590	38	18	22·98	4·88	18·10	0·50
11							1,000	32	12	19·32		19·32	
12[3]	150		350			150	2,700	61	26	36·86	15·11	21·75	4·15
13	150		350			30	2,320	55	10	33·10	9·16	23.94	6 34
14							740	25	10	15·10		15 10	
15						150	760	27	22	16·42	3·90	12·52	−5·08
16	150		350			150	2,560	68	28	41 08	11 75	29 33	11·73
17			350				1,160	30	20	18·20	3·50	14·70	−2 90
18					500		1,240	37	2	22 22	7 00	15 22	−2·38
19							780	30		18·00		18 00	
20			350			150	1,860	45	20	27·20	7·40	19·80	2·20
21				500			860	33	18	19·98	3 75	16 23	−1 37
22	150			500			2,160	54	4	32 44	8 63	23 81	6 21
23	150					150	1,940	54	24	32 64	8 78	23 86	6·26
24	150		350				2,200	58	28	35 08	8 38	26 70	9·10

The average value of the crop from the four unfertilized plots is $17.60 per acre. The value of the fertilized plots, after deducting the cost of fertilizer, varies from $29.33 to $18.10. The maximum net profit from the use of fertilizer is $11.73 (plot 16); it was obtained from an application of a complete fertilizer at the rate of 650 pounds per acre. The minimum net profit is 50 cents per acre (plot 10). Of the twenty plots fertilized, fifteen gave a profit and five showed a loss.

In table IV we present a comparative summary of the essential data of this experiment with those from the plots in the preceding year. The table also furnishes information respecting the profits and losses from the employment of any one element, any two elements, and from the use of all three elements, in the formula. For the purpose of comparison and study, similar data are included for the experiments at Fredericton, N.B., in 1913.

[1] Mixed and applied at rate of 400 pounds per acre.
[2] " " 600 " "
[3] " " 800 " "

Note:—The check plots (no fertilizer) are Nos. 6, 11, 14 and 19.

TABLE IV.—Profits and Losses from the Use of Fertilizers.

	Kentville, N.S.				Fredericton, N.B.	
	Oats.		Potatoes.		Potatoes.	
	1914.		1913.		1913.	
Maximum net receipts	$29·33		$101·91		$124·37	
Average from check plots without fert'zer	17·60		58·14		61·60	
Maximum net increase ($) due to fertilizer	11·73		43·77		62·77	
" " (per cent) "	66·65		75·3		101·90	
	Profits.	Losses.	Profits.	Losses.	Profits.	Losses.
	p.c	p.c.	p.c.	p.c.	p.c.	p.c.
Using any one Element.						
					15·0	
Nitrogen only	2·8		30·1		30·8	
Phosphoric acid only		7·8	7·9			5·7
		13·5	14·7			23·2
		16·5	41·2			
Potash only		28·8		3·4	33·7	
Lime only					2·7	
Using any two Elements.						
Nitrogen with phosphoric acid	35·3		10·85			19·3
	51·7		33·9			28·3
Nitrogen with potash	35·6		32·5		42·9	
Phosphoric acid with potash	12·5		9·9		15·4	
					29·4	
Using all three Elements.						
	9·6	7·1	6·4		78·15	
	16·0		8·4		87·5	
Nitrogen with phosphoric acid and potash	19·3		11·7		93·15	
	23·6		14·8		96·0	
	27·9		40·5		101·6	
	36·0		45·0			
	41·7		54·7			
	44·0		59·2			
	55·2		60·3			
	66·7		63·4			
			75·3			

As in 1913, the results of the past season at Kentville, N.S., with potaoes show that the largest profits and the largest number of cases giving a profit, followed the application of all three elements of plant food. Nitrogen only gave a very small profit (2·8 per cent); phosphoric acid only resulted in losses on all three plots, ranging from 7·8 to 16·5 per cent; potash only (one plot) gave a loss of 28 per cent; nitrogen with phosphoric acid (two plots) gave profits 35·3 and 51·7 per cent; nitrogen with potash (one plot) gave a profit of 35·6 per cent; and phosphoric acid with potash (one plot) a profit of 12·5 per cent. Of the eleven plots with a complete (nitrogen, phosphoric acid, and potash) fertilizer, one only showed a loss, of 7·1 per cent; the remaining ten plots gave profits ranging from 9·6 per cent to 66·7 per cent.

Further, as in 1913, the largest profits have not invariably followed the application of the largest amounts of fertilizer. As already noted, the largest net profit was

from an application of 650 pounds per acre. The second largest profit was from 400 ounds per acre, and the third from 500 pounds per acre.

Experiment IV.

To ascertain the relative Values of the various Forms of Nitrogen and Phosphoric Acid in a Complete Fertilizer, with and without Lime.

This experiment, undertaken both at Fredericton, N.B., and Kentville, N.S., was inaugurated to obtain further data on the relative effects of various forms and amounts of the above elements, and to ascertain the value of lime in conjunction with the fertilizers. The results should be in a large measure comparable with those of experiment I, provided the soils on both areas are similar. This season (1914) potatoes were used as the crop, and it is the intention to continue the investigation on the area throughout a rotation of three or four years, to learn the influence of the fertilizer residues on succeeding crops.

At Fredericton, N.B., the plots, six in number, were in duplicate (twelve in all) and measured one-twentieth acre each. The arrangement of the plots was such that the duplicates were some distance apart. One-half of each plot was limed at the rate of 1 ton of air-slaked lime per acre. The series included, in addition, two check plots, to which no fertilizer was applied, but to one of which lime was added at the aforesaid rate.

At Kentville, N.S., the plots were similarly one-twentieth acre each. The soil is a light loam of poor quality; it had been in corn the previous season. For this corn crop, 400 pounds per acre of a complete fertilizer with the formula 4:8:10 had been used. The test crop employed this season (1914) as at Fredericton, was potatoes, the variety being Green Mountain. The season was favourable to this crop except in July, which was exceedingly dry. The soil was well cultivated, and moisture conditions were fairly good. The "stand" over the whole area was quite even, but the plants presented a stunted and starved condition. The crop was planted May 30 and harvested October 10. The plots were sprayed three times, once with Paris green and arsenate of lead, once with Paris green, arsenate of lead, and Bordeaux mixture, and once with Bordeaux mixture.

Table V presents the amounts of the several fertilizers employed and the results obtained.

TABLE V.—The Comparative Values of various Forms of Nitrogen and Phosphoric Acid. All the Plots save the checks, were supplied with potash.

Plots.	Nitrate of Soda.	Sulphate of Ammonia.	Superphosphate.	Basic Slag.	Bone Meal.	Muriate of Potash.	Lime.	Fredericton, N.B. (Potatoes) Duplicates.				Average.		Kentville, N.S. (Potatoes) Duplicates.				Average.	
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
I A	140		150	150		101·2		275	20			275	2	75	50	71	20	73	35
B	140		150	150		101·2	Limed	516				516		88	35	83	10	85	53
II A		105	150	150		101·2		474				474		72		67	20	69	40
B		105	150	150		101·2	Limed	288				288		76		96	40	86	20
III A	70	52·5	300			101·2		240	40	380		320	20	95	30	72		83	45
B	70	52·5	300			101·2	Limed	244	40	323	20	284		101	20	79	30	90	25
IV A	70	52·5		300		101·2		240	40	281	20	261		104	10	65	40	84	55
B	70	52·5		300		101·2	Limed	468		323	20	395	40	112	20	72	40	92	30
V A	50	37·5			240	101·2		240	40	218	40	229	40	73	40	64	40	69	10
B	50	37·5			240	101·2	Limed	184		365	20	274	40	86	40	70	40	78	40
VI A. No fertilizer								242	40	128		185	20	62	40	49	10	55	55
B. No fertilizer							Limed	458	40	357	20	408		71	20	63	50	67	35

DISCUSSION OF RESULTS.

The discrepancies or differences between duplicates are in many instances very large. This is true for both series, but especially is it the case with the results obtained at Fredericton. This absence of reasonable agreement is most unfortunate, for not only does it indicate lack of uniformity in soil conditions and unsuitability of the areas for experimental purposes, but it makes it exceedingly difficult to draw, with confidence, any conclusions as to the influence of the fertilizers on yields. A study of the table reveals that, in many instances, differences between duplicates are as large as those shown by plots under different treatments. Thus, the yields from the duplicate unfertilized plots at Fredericton show a difference of 114 bushels, 40 pounds; between the duplicate plots of III A the difference is 139 bushels 20 pounds, between the duplicate plots of III B there is a difference of 78 bushels 40 pounds and so on; whereas between different fertilizer treatments the yields may be much closer, as witness the average yields from III B and IV A, 284 and 261 bushels, respectively, a difference of only 23 bushels. Under these circumstances, deductions as to the relative efficiency of the various fertilizer mixtures, etc., must be made with great caution.

At Fredericton, liming increased the yields in four of the six groups, the largest increases from the trials in duplicate being from the unfertilized plots. Apparently lime alone may double the crop on the land of this area.

At Kentville, liming effected an increase in all six groups of the series, but the increases are not of the same magnitude as those at Fredericton.

It does not appear that liming materially increased the efficiency of any of the fertilizer mixtures used, for the increases following a continued treatment of fertilizer and lime are for the most part not larger than the increases that can be accounted for as due to the effect of the fertilizer plus that of the lime. Thus complete fertilizers yielded increases over unfertilized crops, as high as 260 per cent; lime alone (2,000 pounds per acre) as high as 220, and complete fertilizers plus lime as high as 280 per cent.

The yields throughout the series at Kentville are exceedingly poor, and the increases due to the application of fertilizer in the larger number of instances, have not been such as to furnish a profitable return on the outlay for the material.

A recapitulation of the data of table V is presented in table VI.

TABLE VI.—Summary of Yields from Experiment IV, at Fredericton, N.B., and Kentville, N.S.

	Fredericton, N.B. (Potatoes)				Kentville, N.S. (Potatoes.)			
	Not Fertilized.		Fertilized.		Not Fertilized.		Fertilized.	
	bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
Not limed	242	40	275	20	62	40	73	35
	128		474		49	10	69	40
			330	20			83	45
			261				84	55
			229	40			69	10
Average	185	20	314	4	55	55	76	13
Limed	458	40	516		71	20	85	53
	357	20	288		63	50	86	20
			284				90	25
			395	40			92	30
			274	40			78	40
Average	408		351	40	67	35	86	45

At Fredericton, lime alone, using four plots, gave an increase of 222 bushels 40 pounds per acre; at Kentville the increased yield due to lime alone was 11 bushels 40 pounds.

The average increase in yield following the application of fertilizer alone, was, at Fredericton, 128 bushels 44 pounds per acre, and at Kentville 20 bushels 18 pounds per acre.

Comparing the yields from the plots with lime only with those from plots supplied with both lime and fertilizer, we find at Fredericton the average from the former (two plots only) is larger than from the latter (five plots). At Kentville, the plots furnished with fertilizer and lime gave an average increase of 19 bushels 10 pounds over the plots that were limed only.

Experiment V.

To ascertain the Influence of decreasing Amounts of Potash in a complete Fertilizer, on Potatoes.

This experiment had for its object the ascertainment of the influence of decreasing amounts of potash in a complete fertilizer on potatoes. It comprised four plots, including one unfertilized used as a check. The work was conducted at Fredericton, N.B.

The results, briefly, are as follows:—

Table VII.—Results of varying amounts of Potash in a complete Fertilizer on Potatoes.

Plot.	Application.	Fertilizer Formula.	Containing Potash.	Yield per Acre.
	lb.		lb.	bush.
1	1,000	4 : 8 : 10	100	275
2	1,000	4 : 8 : 6	60	305
3	1,000	4 : 8 : 3	30	254
4	No Fertilizer.			171

All the fertilized plots gave marked increases over the yield from the unfertilized plot ,but it seems quite probable, from the results of Experiment I at this Station that these increases might have been obtained with a smaller application than 1,000 pounds per acre. With respect to the value of different amounts of potash, it would scarcely be justifiable, considering the lack of uniformity in the soil over this area, to draw any inferences from the yields of plots, 1, 2, and 3. Possibly on all of them more potash was applied than could be profitably used, but these results certainly indicate that an application of more than 100 pounds of potash (K_2O) per acre is not required.

Experiment VI.

To ascertain the Value of Fertilizer on Turnips, at Fredericton, N.B.

The area, one acre, was planted with corn in 1913, and had been manured in the spring of that year with eighteen loads (35 bushels each) of horse manure and 468 pounds of a complete fertilizer of the formula 3·6:10:5·5, per acre. The corn stubble was ploughed in the autumn.

In 1914, sixteen loads of horse manure were thoroughly worked into the soil, and 300 pounds of basic slag, per acre, applied broadcast. On one-half acre, fertilizer was applied at the rate of 265 pounds per acre, made up of 40 pounds of nitrate of

soda, 40 pounds of sulphate of ammonia, 70 pounds of bone meal, 70 pounds of superphosphate, and 45 pounds muriate of potash. The remaining half-acre received no fertilizer.

The plot to which the fertilizer had been applied gave an increased yield equivalent to 43 bushels 20 pounds per acre. At 10 cents per bushel this increase was worth $4.34. The cost of the fertilizer per acre was $4.89.

Experiment VII.

To ascertain the Value of Fertilizer on Indian Corn, at Fredericton, N.B.

This land was newly broken and sown to oats in 1912. In 1913 it received twenty 35-bushel loads of horse manure and 860 pounds of a complete fertilizer (70 pounds of nitrate of soda, 70 pounds of sulphate of ammonia, 100 pounds of superphosphate, 100 pounds bone meal, 120 pounds muriate of potash, and 400 pounds basic slag) per acre. It was sown to turnips, the yield being 960 bushels per acre.

In 1914 the land was spring ploughed and sixteen 35-bushel loads of manure worked in. There was then applied 250 pounds per acre of a complete fertilizer (31¼ pounds of nitrate of soda, 31¼ pounds sulphate of ammonia, 156¼ pounds superphosphate, and 31¼ pounds of muriate of potash). This was drilled in with the corn planter. Longfellow was the variety of corn planted. The season, as a whole, was unfavourable for this crop.

The yield of corn from the fertilized area was at the rate of 7 tons 1,664 pounds per acre; from the unfertilized area, 7 tons 1,090 pounds.

The value of the 674 pounds increase on the fertilized area, at $3 per ton, would be $1.01, and the cost of the 250 pounds of fertilizer was $3.61.

Mr. Hubbard remarks: "The fertilizer had quite a marked effect in the early part of the season, and on the 1st August the appearance of the two plots would lead the observer to suppose that the fertilized area would give nearly double the crop of that without fertilizer. Afterwards, the crop evened up and no difference was apparent in height of stalk, number or maturity of ears, when the crop was harvested."

Experiment VIII.

To ascertain the Value of Fertilizer on Vegetable Crops, at Fredericton, N.B.

The following experiments to ascertain the effect of certain fertilizer mixtures on the growth of garden crops, were devised and carried out by Mr. W. W. Hubbard, Superintendent, Experimental Station, Fredericton, N.B. It is not to be assumed that the formulæ used are the best for the respective crops to which they were applied, nor that the amounts employed are those which might be expected to give the most profitable returns. The experiments are purely empirical in nature, and the results therefrom are to be regarded with that fact in mind Other formulæ and other amounts might prove more economical, that is, might show a larger profit from their use.

The land had been manured in 1913 with 20 tons of farm manure and 700 pounds of a fertilizer with the formula 2.75:10.6:8.3 per acre.

TABLE VIII.—Fertilizer Results with Beans and Peas.

Variety.	Length of Row.	Manure 30 tons per acre.	Manure 15 tons per acre 300 lb. super-phosphate, 120 lb. muriate of potash.	Increase in Yield.
BEANS.	Ft.	Yield—pecks.	Yield—pecks.	p. c.
Valentine Wax	66	5¾	8½	47·8
Wardwell's Kidney Wax	66	5½	6	9·1
Extra Early Valentine	66	5	5¾	15·0
Extra Early Refugee	66	5½	5¼	....
New White Seeded Stringless	66	4½	6	33·3
Kidney Rustless Golden Wax	66	3½	6¾	92·8
PEAS.				
Heroine	33	5½	6	9·1
Telephone	33	5	5	....
Gradus	33	2¾	4¼	54·5
Juno	33	4	3	....
Early Giant	33	2¾	3½	27·3
Quite Content	33	3	3	....

TABLE IX.—Fertilizer Results with Beets and Carrots.

Variety.	Length of Row.	Manure 30 tons per acre.	Manure, 15 tons. Nitrate of Soda. 130 lb. Superphosphate 433 lb. Muriate of Potash 117 lb. per acre.	Increase in Yield.
BEETS.	Ft.	Yield—lb.	Yield—lb.	p. c.
Ruby Dulcet	66	62·5	81·2	30
New Meteor	66	60·7	73·7	21·4
Early Blood Red	66	55·0	64·9	18·0
Black Red Ball	66	45·0	50·1	11·3
CARROTS.				
Imperial Nantes	66	118·5	145·9	23·1
Chantenay	66	105·8	126·8	19·9
French Horn	66	102·9	108·9	5·8

TABLE X.—Fertilizer Results with Celery and Onions.

Variety.	No. of Heads.	Manure 30 tons per acre.	Manure, 15 tons. Nitrate of Soda, 240 lb. Superphosphate, 480 lb. Muriate of Potash, 200 lb. per acre.	Increase in Yield.
CELERY.	Dozen.	Yield—lb.	Yield—lb.	p. c.
Improved White Plume	1	20·4	23·2	13·7
Giant Pascal	1	20·0	22·6	13·0
Evan's Triumph	1	16·0	19·0	18·8
White Plume	1	14·6	19·2	31·5
Noll's Magnificent	1	12·2	13·8	13·1
French Success	1	10·6	12·0	13·2
Paris Golden Yellow	1	11·4	10·0	....
ONIONS.	Length of Row. Ft.			
Danvers Yellow Globe	66	20·1	25·4	26·4
Baker's White Globe	66	20·4	24·2	18·6
Baker's Yellow Globe	66	20·5	22·2	8·3
Baker's Red Globe	66	18·9	22·1	17·0
Large Red Wethersfield	66	17·7	18·3	3·4
Saltzer's Giant Red Wethersfield	66	15·8	17·0	7·6
Johnson's Dark Red Beauty	66	7·9	12·2	54·4

TABLE XI.—Fertilizer Results with Tomatoes.

Variety.	Length of Row.	Manure, 30 tons per acre.			Manure, 15 tons. Nitrate of Soda, 120 lb. Superphosphate, 480 lb. Muriate of Potash, 168 lb. per acre.			Increase in Yield.
		Ripe.	Green.	Total.	Ripe.	Green.	Total.	
	Ft.	lb.	lb.	lb.	lb.	lb.	lb.	p. c.
Sunnybrook Earliana	66	87·1	48·5	135·6	102·9	56·0	158·9	17·2
Rennie's Extra Early	66	71·9	66·0	137·9	71·6	42·4	114·0	......
Northern Adirondack	66	30·7	53·3	84·0	69·2	93·0	162·2	93·1
Alacrity	66	49·0	31·0	80·0	83·9	39·0	122·9	53·6
Extremely Early	66	52·8	42·0	94·8	65·2	30·2	95·4	0·6
Florida Special	66	13·2	43·5	56·7	39·9	34·2	74·1	30·7
Prosperity	66	32·3	24·5	56·8	28·2	30·5	58·7	3·3
Johnson's Jack Rose	66	27·2	11·7	38·9	32·7	34·5	67·2	72·8
Trophy	66	17·1	49·3	66·4	13·2	10·0	23·2	......
Chalk's Early Jewel	66	9·5	22·0	31·5	11·2	46·2	57·4	82·2
Matchless	66	14·1	22·5	36·6	10·4	15·5	25·9	......

TABLE XII.—Influence of Fertilizers on Vegetables. Summary of Results.

No. of Varieties.	Kind.	Increase due to Fertilizer.
		p. c.
6	Beans	32·24
4	Beets	20·2
3	Carrots	16·3
7	Celery	13
7	Onions	19·3
6	Peas	11·0
12	Tomatoes	20·4
44		18·8

EXPERIMENT IX.

To ascertain the Value of Fertilizer on Mangels and Potatoes, at Agassiz, B.C.

This experiment was planned and conducted by Mr. P. H. Moore, Superintendent Experimental Farm, Agassiz, B.C. The main object in these trials was to ascertain the value of potash, applied with nitrogen and phosphoric acid, for the mangel and potato crops. No provision was made in the scheme to obtain information as to the best forms in which to supply the elements nor to learn the smallest amounts of each required; in other words, to obtain the maximum increase at the least cost. The results, however, are valuable as indicating the advantages of a complete fertilizer and the possible increases which may be obtained from its employment. It may be thought that the returns indicate the value of potash as against nitrogen and phosphoric acid, but such is not the case. Probably if nitrogen and, similarly, phosphoric acid, had been omitted on plots, as was potash, the results would have shown that these elements were equally valuable in increasing the yields.

The land was a rather poor sandy loam, and had been cropped for a number of years. Previous to 1910 it had been in grass for several years. In 1910 it was summer-fallowed. In 1911 it was sown to grain and seeded down with clover. In 1912 two crops of clover were cut and made into hay, and in the autumn of that year and in 1913 it was pastured. It was ploughed in the early fall of 1913, top-worked and again ploughed. In the spring of 1914 it was dressed with farm manure at the rate of 24 tons per acre, which was worked in with the disc harrow. The size of the plots was one-eighth acre each. The fertilizers applied and the yields obtained per acre are set forth in the following table:—

TABLE XIII.—Influence of Fertilizers on Mangels.

Plot.	Manure.	Nitrate of Soda.	Super-Phosphate.	Muriate of Potash.	Yield, 1914.		Average Yield 3 Years. 1912-14.	
	tons.	lb.	lb.	lb.	tons.	lb.	tons.	lb.
1	24	160	400	160	25	85	26	1,589
2	24	160	400		22	32	25	333
3	24				4	60	12	102
4	24	100	350	150	23	700		

TABLE XIV.—Influence of Fertilizers on Potatoes.

Plot.	Manure.	Nitrate of Soda.	Super-phosphate.	Muriate of Potash.	Yield, 1914.	Average Yield, 3 years. 1912-1914.
	tons.	lb.	lb.	lb.	tons. lb.	tons. lb.
1	24	160	400	200	11 1,472	11 84
2	24	160	400	....	9 888	10 176
3	24	....	....	....	7 1,684	8 1,383

The possible increases from the use of a complete fertilizer are:—

	1914.	Average for 3 Years.
	p. c.	p. c.
For mangels	521·4	122·3
For potatoes	41·0	27·0

GENERAL CONCLUSIONS.

From the experimental work of 1913 and 1914, the following conclusions, we think, may be fairly drawn:—

(1) That a judicious and rational use of fertilizers may, in a very large number of instances, be depended upon to yield a profit. Injudiciously applied a monetary loss may result.

(2) That with certain crops, especially potatoes and roots, the yield may be largely increased by fertilizers, frequently doubled. The profit obtained, over and above the cost of fertilizer, should always be calculated by the farmer, and not merely the increase in yield noted. This is only possible when the crop is also grown, harvested and weighed from a plot similar in size and condition of soil, but to which no fertilizer has been applied.

(3) That, in general, it is advisable to use a complete fertilizer; that is, one supplying nitrogen, phosphoric acid, and potash.

(4) That fertilizers give increases in crop yields on many types of soil; even those soils which are considered fairly rich frequently yield increases, though these increases may not in all cases show a profit after deducting the cost of the fertilizer.

(5) That large dressings of fertilizer do not necessarily mean large increases in yield or large net profits. In our experiments with potatoes, the profitable application has seldom exceeded 400 pounds per acre. For many field crops the profitable amount and kind of fertilizer has yet to be ascertained.

(6) That the manipulation of fertilizer formulæ to meet the specific requirements of certain crops, as frequently practised and advertised by fertilizer manufacturers, is of little significance. It is unscientific and unnecessary. In general farm practice this manipulation, in fact, has no bearing or application, since the amounts of all the several ingredients, nitrogen, phosphoric acid and potash applied are, as a rule, in excess of the minimum requirements for a profitable return.

DEDUCTIONS AFFECTING FUTURE EXPERIMENTAL WORK WITH FERTILIZERS.

The following paragraphs have been written with the view of furnishing the farmer with certain information of a fundamental character respecting the fertilizer problem and its solution.

1. The object of rational experimental work with fertilizers is to devise and establish methods of procedure which will result in showing how the largest profits may be obtained at the minimum expenditure for fertilizer. Such a plan has been worked out for future employment on several of the Dominion Experimental Farms and Stations.

2. With "money" crops, such as potatoes, vegetable and market garden crops, the plan of investigation need not make provision for work of a very detailed or exact nature, for our results go to show that for these it is a tolerably safe investment to apply on land below its maximum producing power, 400 to 600 pounds of any rationally compounded complete fertilizer. But with crops of a low money value, per acre yield, such as grasses, cereals, forage crops, etc., the case is different; for these the greatest care and exactness in experimentation is demanded. A difference here in cost of fertilizers of $2 per acre may turn what might have been a profit into a loss.

3. In all cases the following requirements are to be studied: (a) the best forms, or mixtures of forms, in a complete fertilizer; and (b) the smallest amount of each element needed for the maximum increase of yield. This latter, for convenience, may be called the "minimum" of each element.

4. Comparisons of economic value can only be made at the minimum, and this is ascertained by finding the amounts and costs of the various ingredients necessary to give the largest net profits.

THE INFLUENCE OF LIMING ON THE PRODUCTIVENESS OF CERTAIN SOILS.

In several of the past reports of this Division, and still more fully in the recently issued bulletin "Lime in Agriculture," we have explained the function and value of lime and certain lime compounds, such as marl and finely-ground limestone, in soil improvement. For this reason it will be unnecessary here to enter upon any discussion respecting the many ways in which a rational employment of these lime compounds may vastly increase the productiveness of many soils, chemically, physically, and biologically. As an illustration of the practical value of liming, however, we consider that the citation of our experience in this matter on one of the Experimental Stations will be read with interest and profit by many farmers.

In 1913 it was reported from the Experimental Station at Cap Rouge, Quebec, that the wheat, oats, and barley on the trial plots had proved a complete failure, which could not be attributed to adverse weather conditions. A careful study of the conditions and circumstances made it probable that the difficulty or cause of failure was due to a lack of available lime in the soil. It was, therefore, determined to analyze samples of soils from two of these affected plots and if a deficiency of lime were indicated, to make a practical trial with liming towards their improvement. Our report on these soils, made in February, 1914, together with the deductions from the analytical work on samples collected in August, 1913, is as follows:—

The area from which these two soils were taken had been under cultivation for a very long period, probably over 100 years. It is considered very fairly uniform throughout. Immediately previous to the purchase of the farm by the Dominion Government it had carried two rotations each of four years of corn, oats, clover, and timothy. In 1911, the first year of its cultivation as part of the Experimental Station, it bore a crop of Indian corn; similarly, in 1912, it carried a corn crop. It received an application of 25 tons of cow manure in the spring of 1911, and a like application in the spring of 1912.

In 1913, the area was in part devoted to the growing of cereals in plots under the direction of the Dominion Cerealist. The complete failure on the barley and wheat plots led to the present investigation, which was to learn whether the soil, from one

cause or another, was specially deficient in any element of plant food, or possessed any property that might be injurious to crop growth.

The wheat was sown April 29, and the barley on April 30. The seed showed a low germinative power, from 57 to 75 per cent. On May 8, 10, and 11 the temperature fell to 30 degrees F. and to 25 degrees and 27 degrees, respectively, on the 15th and 16th, injuring the young plants. The crop on the "oat plots looked fair to excellent," but on the wheat and barley plots it was almost a complete failure, there being a very sparse stand of badly stunted plants, for the most part immature and with very few and small heads.

The two samples examined are from plots sown to wheat and barley, respectively, being collected in August, 1913, to a depth of 6 inches. It is stated that the soil shows no marked difference in appearance to a depth of 15 inches or more, and that it is underlaid by shale.

The soils are quite similar in general character, and might be described as silty loam. There is a fair proportion of sand and a little clay, the whole making a soil of medium texture, friable, and of fairly satisfactory tilth for most crops. Both contain fragments of shale or slate (showing their origin), and, judging from appearances, both are fairly well supplied with vegetable matter, the "wheat" soil being apparently somewhat the better in this respect. To one accustomed to the critical examination of soils they would probably be adjudged as of fair or medium productiveness, soils capable of some improvement towards mellowness, but which, under favourable seasonal conditions and suitable cultivation, might be expected to give very fair crops.

Both soils were distinctly though not excessively, acid.

The soils were submitted to a thorough chemical examination, and the following data obtained:—

ANALYSIS of (air-dried) Soils from Wheat and Barley Plots, Experimental Station, Cap Rouge, Que.

——	No. 15392 Wheat.	No 15393. Barley.
Moisture	9·15	4·11
Organic and volatile matter	10·48	9·69
Mineral matter, insoluble in acid (clay, sand, etc.)	65·07	68·74
Oxide of iron and alumina (Fe_2O_3, Al_2O_3)	12·89	15·0
Lime (CaO)	·19	·19
Magnesia (MgO)	1·23	·97
Phosphoric acid (P_2O_5)	·20	·19
Potash (K_2O)	1·02	1·28
	100·23	100·17
Nitrogen	·305	·275
Available constituents:		
Lime	·097	·072
Phosphoric acid (P_2O_5)	·041	·039
Potash (K_2O)	·013	·015

DEDUCTIONS FROM ANALYTICAL RESULTS.

The data throughout show that in all essential characters these soils are very similar, indicating that the area from which they were collected is fairly uniform as to chemical composition.

The soils are well supplied with organic matter and nitrogen, in this important respect equalling many of our eastern soils with a good record for productiveness.

In phosphoric acid the content is quite satisfactory, the larger number of arable soils possessing between ·15 and ·25 per cent of this element.

The high percentages of potash present indicate the origin of these soils—shale or clay. In the majority of light and sandy loams, this element usually falls between ·25 and ·50 per cent.

In lime the soils are distinctly poor. This is a very unfavourable feature, indicating not merely an inadequate supply for the crop's needs, but also a condition of the soil that would be unfavourable to nitrification and lead to acidity. In this connection it may be noted that the magnesia content is higher than that of the lime, a feature or condition considered by many agricultural chemists as detrimental to luxurious growth of most farm crops.

The percentages of "available" constituents are those obtained after digestion of the soil with a 1 per cent citric acid solution, and may be regarded as representing the amounts of the several elements determined which are more or less readily available for plant growth.

The amount of "available" phosphoric acid in soils of average fertility usually lies below ·03 per cent; we may therefore conclude from the data obtained that these soils do not exhibit any marked deficiency in this element, at all events for cereal crops.

The percentage of "available" potash, though perhaps not so high as might have been expected in soils showing such a large amount of "total" potash, is not such as to indicate the immediate need of a potassic fertilizer to meet crop requirements.

The very small percentage of "total" lime present has already been commented on; the data give evidence that the proportion which may be considered soluble and available is exceedingly small.

Summing up these conclusions, we may say that, as regards organic matter, nitrogen, phosphoric acid, and potash, these soils are not poor; indeed as regards the essential elements of fertility they possess amounts, both as reserve and in the more available condition, quite equal to those in many soils of average fertility.

It is equally clear, however, that they are markedly deficient in lime, and this fact may account for their acidity and their lack of productiveness.

LIME REQUIREMENTS.

To obtain further evidence as to deficiency in lime in these soils, they have been submitted to two methods of examination recently proposed to determine the amount of lime that it might be necesary to add to a soil to bring about a favourable condition for crop growth. This has been termed the soil's lime requirement. The data are as follows, the calculation being made for 2,000,000 pounds of soil, the weight per acre of a surface layer 7 to 9 inches deep:—

——	No. 15392, "Wheat."	No. 15393, "Barley."
	Lime—lb.	Lime—lb.
By Calcium acetate method	7,596	8,928
Albert's method (modified)	8,512	9,295

Though our knowledge respecting these methods as indicative of a soil's need of lime is extremely limited, we may, it is thought, safely conclude that the above results point to the desirability of furnishing lime in liberal amounts; they strengthen the

deductions made from the analytical data, that these soils are very poor in available lime, to which condition their acidity and the crop failure may be due.

In reporting these results to the Superintendent at Cap Rouge, we recommended a treatment of this area with lime, say at the rate of 2 tons per acre, a strip of the land to be left untreated for the purpose of learning the influence of the lime. "The lime should be put out on the land as early as the season will permit in heaps says of 50 pounds each, and covered with moist earth. In ten days or a fortnight the lime should have become thoroughly slaked, when it may be spread, selecting a calm day for this operation. Assuming that the land was ploughed last fall, all that is necessary or desirable to incorporate the lime with the soil will be to harrow in. If the area was not ploughed last autumn, it would be well to plough this spring before the application of the lime, the subsequent operations being carried out as already indicated."

"Lastly, there is a reasonable doubt that this area is not effectively drained. If such prove to be the case, tile drainage should be put in, as the beneficial influence of the liming will not be fully secured in poorly drained land. Soil of the character under discussion, it may be remarked, requires good and effective drainage; possibly almost to the same degree as does a more heavy loam."

In November, 1914, the Superintendent reported the results of liming certain plots in this area in the spring of that year, the lime being applied at the rate of 2 tons per acre. The crops under trial were oats, barley, wheat, peas, carrots, mangels, sugar beets. The plots of cereals were one-sixtieth acre, and of roots one-fiftieth acre. One of three plots for each cereal was limed, and one of two plots for each class of roots was similarly treated.

The yields from the limed and unlimed plots carrying barley, oats, wheat, and peas are tabulated as follows:—

Influence of Liming on Crop Yields, Cap Rouge, Que., 1914. Grain, Pounds per acre.

	Plot 1 Limed.	Plot 2 Unlimed.	Plot 3 Unlimed.	Plots 2 and 3 Average.
Barley—				
Manchurian	1,200	240	540	390
O.A.C. 21	1,320	210	240	225
Success	1,380	420	240	330
	3,900	870	1,020	
Oats—				
Banner	1,980	1,860	2,040	1,950
Daubeney	2,040	2,220	1,740	1,980
Eighty Day	1,560	1,980	1,260	1,620
Gold Rain	2,340	2,280	1,980	2,130
Victory	2,220	1,080	1,440	1,260
	10,140	9,420	8,460	
Wheat—				
Early Red Fife	1,140	1,560	840	1,200
Huron	1,620	1,740	1,560	1,650
Marquis	720	600	120	360
Red Fife	720	90	120	105
	4,200	3,990	2,640	
Peas—				
Arthur Selected	1,680	840	1,080	960
English Grey	2,100	390	960	675
Golden Vine	1,380	1,320	840	1,080
Prussian Blue	1,920	540	1,020	780
	7,080	3,090	3,900	

Barley.—It will be observed that the yield on the limed plot is practically four times that on the unlimed areas. These results are most marked in character, and emphasize the value of lime on this soil for this crop.

Oats.—It would appear from the data that this crop is not as seriously affected as barley by a sour condition of the soil or a deficiency of available lime. The lime plots do not throughout the series invariably give an increased yield; nevertheless, the results as a whole may be considered as indicating that lime, to a certain degree, has been beneficial.

Wheat.—The yields from the plots of this series show that liming has not been uniformly beneficial. We find, however, that the increases due to the application of lime are, in several instances, most marked, and the "totals" from the limed as compared with those from the unlimed areas, certainly would lead one to conclude that an improvement for this crop had been brought about by liming.

Peas.—The results for this crop are almost equally as emphatic for the value of liming as those from barley. On the limed areas the yields are practically double those on the unlimed.

Roots.—The crops on the unlimed plots of carrots, mangels, and sugar beets made such a very poor "stand" that the plots were ploughed and sown to white turnips, which gave a fair crop. This would indicate that this latter crop is better able to withstand sourness or a deficiency in lime than the other farm roots.

The yields for the limed plots sown with carrots mangels, and sugar beets are as follows:—

Yield from Limed Plots—Carrots, Mangels and Sugar Beets—per acre.

Variety.	Plot 1.	Plot 2.
	lb.	lb.
Carrots—		
Giant White Vosges	11,200	11,600
Improved Short White	7,000	13,200
Mammoth White Intermediate	13,900	10,200
Ontario Champion	8,500	10,400
White Belgian	11,000	6,500
Mangels—		
Danish Sludstrup	23,100	19,400
Gate Post	14,800	21,900
Giant Half Sugar White	23,200	17,800
Giant Yellow Globe	1,600	13,800
Giant Yellow Intermediate	22,400	26,700
Golden Tankard	14,800	10,300
Mammoth Long Red	17,200	19,000
Perfection Long Red	10,400	24,800
Prize Mammoth Long Red	15,600	20,200
Selected Yellow Globe	7,900	23,200
Yellow Leviathan	20,500	22,500
Sugar Beets—		
French Very Rich	2,000	9,000
Klein Wanzleben	10,400	10,000
Vilmorin's Improved A	10,800	10,400
Vilmorin's Improved B	10,200	10,800

When it is considered that the crops on the unlimed area were so poor that they were judged a "complete failure," the value of liming on this soil for the several classes of roots just enumerated will be apparent, for the above yields are, on the whole, if not large, fairly satisfactory under the circumstances.

Swedish Turnips.—This crop, from the present results, does not appear to be adversely influenced by soil conditions such as we are now considering; or, in other words, liming has not increased the yield of this farm root. If this is confirmed by future work, the deduction may prove of value to those whose land is deficient in lime, and who cannot, for the time being, supply the deficiency.

YIELD from Limed and Unlimed Plots, Swedish Turnips—pounds per acre.

Variety.	Limed.		Unlimed.	
	Plot 1.	Plot 2.	Plot 1.	Plot 2.
	lb.	lb.	lb.	lb.
Bangholm selected	49,700	47,700	55,300	45,400
Canadian Gem	53,200	61,600	56,600	51,500
Corning's Lapla d	59,000	56,200	62,700	61,300
Good Luck	64,900	67,800	61,800	65,300
Halewood's Bronze Top	31,500	61,900	50,900	50,600
Hall's Westbury	48,100	48,800	53,000	31,000
Hartley's Bronze Top	53,200	51,600	57,500	42,600
Hazard Improved	50,200	61,900	48,600	54,900
Jumbo	52,300	56,500	47,800	54,900
M gnum Bonum	56,500	69,400	62,400	62,600
Mammoth Clyde	62,200	56,800	66,800	55,300
New Century	50,400	55,700	51,600	64,500
Perfection	66,400	54,300	57,200	56,600

This work as to the value of liming will be continued. The cereal plots have been seeded with timothy and clover, so that the influence of lime on the hay yield will be obtainable this season, 1915. The experiments with farm-roots on limed and unlimed areas will also be continued. The influence of liming may be gradual, on certain soils it may not be fully evident in the year of application. The carrying on of the investigation, using the areas now under experiment, may therefore give still further valuable results.

FERTILIZING MATERIALS.[1]

Under this caption we present the analysis of a number of materials examined during the past year as to fertilizing value. These include limestones, marls, wood ashes, mucks, peats, river and tidal muds, etc., and certain by-products from manufacturing processes containing plant food. There are many substances occurring in Canada which may be used for soil improvement, and which frequently can be obtained at little cost; it is to furnish farmers with information respecting their agricultural value and use that this Division has year by year analysed and reported upon samples of this character submitted from various parts of the Dominion.

LIMESTONE.

The functions of lime, ground limestone, and marl as amendments of very considerable agricultural value have been discussed in several of the more recent annual reports of this Division and in Bulletin No. 80, issued in the early months of the present year, the whole subject in all its phases has been very fully considered. It will therefore be unnecessary to enter upon details as to the use and purpose of these materials in agriculture. It may, however, be noted that within the past two years

[1]Farmers and others may be again reminded that the analysis of commercial fertilizers as sold in Canada does not come within the scope of the work of this Division. Matters relating to alleged adulteration of these fertilizers should be referred to the Inland Revenue Department, Ottawa, the branch of the Government service that administers the Fertilizer Act in Canada.

there has been an ever-increasing interest on the part of farmers throughout the Dominion in the use of lime compounds, and that there is at present a widespread inquiry as to their place in rational farming for improvement of soils and the increase of fertility. To all who seek information on this important subject we recommend the reading of the special bulletin already referred to.

The larger number of samples of limestone and crushed or pulverized limestone examined during the year have been submitted by the Department of Agriculture of the province of New Brunswick. In February last, Mr. R. Newton, Director of Agricultural Schools, Woodstock, N.B., wrote us: "The deficiency in lime in many of our New Brunswick soils is serious enough to constitute an important problem. Since pulverized limestone has been found just as effective as burnt lime, as well as a cheaper and more advantageous form to use, and as limestone deposits are widely distributed over the province, the Department of Agriculture, New Brunswick, has purchased a first-class portable pulverizing plant, which will be used to make demonstrations in the production of this material in as many localities as possible during 1915. A charge will be made to cover the operation of the machine during the actual process of pulverizing. The machine has a stated capacity of 2 to 3 tons per hour, depending on the hardness of the stone and the size of the pieces. We think it well to have analyses made of samples of stone submitted by parties applying for this machine before sending it to them. Would you be good enough to do this analytical work for us, and if so to what extent may we call upon you?"

We replied that we should be glad to assist in this matter as far as time at our disposal permitted, and, it may be added, many samples of limestone have been received from this source. The analyses of those examined to date are herewith given.

Laboratory No 16314.—Limestone, No. 1, from Sussex, Kings Co., N.B.

Laboratory No. 16315.—Limestone, No. 2, from Florenceville, Carleton Co., N.B.

Analysis—	No. 16314. Per Cent.	No. 16315. Per Cent.
Moisture	·11	·13
Mineral matter insoluble in acid	8·63	13·73
Oxide of iron and alumina	2·92	3·22
Carbonate of lime	78·65	79·73
" magnesia	7·98	3·42

In carbonate of lime content there is little to choose between these two samples, so that for agricultural purposes—to be used as ground limestone—they may be considered as of practically equal value. They are not of the highest grade, but of fair quality. The percentage of magnesia is not excessive.

Laboratory No. 17104.—From College Bridge West, N.B.

This sample consisted of fragments of a chocolate-red rock, quite hard and having the appearance of slate or shale.

Analysis—	Per Cent.
Mineral matter insoluble in acid	75·12
Oxide of iron and alumina	14·84
Lime[1]	1·44
Potash	1·04
Phosphoric acid	·40

[1] Equivalent to carbonate of lime 2.57 per cent.

It was claimed that this rock weathered easily, becoming reduced to the form of powder by the frost and rain, and that, applied to land, it encouraged the growth of clover.

The analysis shows that this is not a limestone. The small proportions of such plant food as it contains are in all probability in such an unavailable condition that

the value of the material as a fertilizer is negligible. It is extremely doubtful, even if the rock were finely crushed, whether a profitable return would be obtained from its use.

Laboratory No. 20222.—From deposit on farm of T. Barnes, Sussex, N.B.

Analysis—	Per Cent.
Mineral matter insoluble in acid	7·26
Oxide of iron and alumina	3·20
Carbonate of lime	83·45

This is a very good limestone and one quite suitable for agricultural purposes. This rock was subsequently pulverized by the Sussex and Studholm Agricultural Society.

Laboratory No. 20267.—From deposit on farm of John Hughes, Petitcodiac, N.B.

Analysis—	Per Cent.
Mineral matter insoluble in acid	2·18
Oxide of iron and alumina	3·47
Carbonate of lime	94·1

This is a limestone of excellent quality and would prove very satisfactory for agricultural use.

Laboratory No. 20346.—Sent as crushed limestone from St. John, N.B.

Analysis—	Per Cent.
Mineral matter insoluble in acid	77·06
Oxide of iron and alumina	11·30
Carbonate of lime	5·12

The firm grinding this material, it is stated, consider that it is valuable as a fertilizer on account of its supposed potash content.

It is not a limestone, though it contains some five per cent of carbonate of lime. No doubt, as alleged, it would contain some potash, but this will exist in such an inert and insoluble condition that it would not be more available than that of the potash minerals naturally present in the soil. It is evidently in the same class as the so-called "stone meal" and "mineral fertilizers," which we have reported on (Report Division of Chemistry, 1911) and which cannot be considered as fertilizers in the correct meaning of the term. At the best, they could only act as amendments. From any standpoint their monetary value must be exceedingly small.

Laboratory No. 20663.—Pulverized Limestone from Sussex, N.B.

Analysis—	Per Cent.
Mineral matter insoluble in acid	3·43
Oxide of iron and alumnia	·48
Carbonate of lime	93·97
Undetermined	2·12
	100·00

Mechanical analysis—	Per Cent.
Passes 12-mesh screen	99·45
" 50 "	58·58
" 80 "	39·85

This is excellent as to quality, and quite satisfactory as to degree of fineness.

Laboratory Nos. 20666 and 20667.—From deposit on Daniel's Brook at the foot of Shepody mountains, Hopewell, N.B.

Analyses—	No. 1. Lab'y. No. 20666. Per Cent.	No. 2. Lab'y. No. 20667. Per Cent.
Mineral matter insoluble in acid	58·15	27·20
Oxide of iron and alumnia	6·05	3·80
Carbonate of lime	28·21	63·23
Undetermined	7·59	5·77
	100·00	100·00

No. 1 is a very poor limestone of inferior quality and not worth grinding. No. 2 is decidedly better, but of medium quality only.

Laboratory No. 20009.—Crushed limestone from Hull, Que.

Analysis—	Per Cent.
Mineral matter insoluble in acid	21·64
Oxide of iron and alumina	3·14
Carbonate of lime	70·82
Undetermined	4·40
	100·00

Mechanical analysis—	Per Cent.
Passes 12-mesh screen	26·0
" 50 "	4·0
" 80 "	3·0

This is not a limestone of the first quality, but nevertheless is one that could be used to advantage for agricultural purposes. The material is very much coarser than the ground or pulverized limestone usually found on the market; finer grinding would undoubtedly enhance its value for immediate action in the soil.

Laboratory No. 20589.—Limestone forwarded from St. Marys, Ont.

Analysis—	Per Cent.
Mineral matter insoluble in acid	2·43
Oxide of iron and alumina	0·35
Carbonate of lime	90·88
Undetermined	6·34
	100·00

Limestones of the highest grade will contain from 95 per cent to 98 per cent of carbonate of lime. This sample, however, is above the average, and would furnish, when finely ground, an excellent material for the improvement of soils in need of lime.

Laboratory No. 19689.—Dark grey limestone, forwarded from Montague, P.E.I., but stated to be quarried in Nova Scotia.

Analysis—	Per Cent.
Mineral matter insoluble in acid	14·30
Oxide of iron and alumina	2·12
Carbonate of lime	82·00
Undetermined	1·58
	100·00

This is not a limestone of the first quality, but is of sufficient richness to furnish a material quite serviceable for agricultural purposes.

Laboratory No. 19690.—Designated "lime" and presumably produced by the incomplete burning of limestone No. 19689.

Analysis—	Per Cent.
Mineral matter insoluble in acid	17·62
Oxide of iron and alumina	5·07
Lime	54·41

The lime is present partly as oxide (quicklime) and partly as carbonate. Though not a good quality of lime, and quite unsuitable for the making of mortar, etc., it could be advantageously used for the treatment of land that would be improved by liming.

Laboratory Nos. 15670 and 15671.—From Tsinkut lake, B.C., and forwarded as specimens of the rock in the neighbourhood, supposed to be limestone.

Analyses—	No. 1. Lab'y. No. 15670. Per Cent.	No. 2. Lab'y. No. 15671. Per Cent.
Mineral matter insoluble in acid	61·09	64·63
Oxide of iron and alumina	17·57	16·15
Carbonate of lime	9·80	10·22
" magnesia	11·25	9·10
Undetermined	0·29	....
	100·00	100·00

The analyses accord so closely that we may conclude both specimens are from one and the same character of rock, impure and inferior limestone. The percentage of carbonate of lime is too small to make burning a practicable or profitable undertaking, but the crushed rock would be of some value to soils that are sour and deficient in lime.

Laboratory No. 17026.—From Hawkesbury, Ont. This limestone is a dark slate-coloured rock, quite hard and refractory.

Analysis—	Per Cent.
Mineral matter insoluble in acid	14·67
Oxide of iron and alumina	4·40
Carbonate of lime	76·52
" magnesia	3·51
Undetermined	0·90
	100·00

This is of inferior quality, but it is sufficiently rich in carbonate of lime to give it an agricultural value. Whether it could be profitably crushed would largely depend on local conditions—the cost of quarrying, grinding, etc. In cases such as this it is generally advisable, before commencing operations, to explore the neighbourhood further for a higher grade of limestone, for the selling price of the crushed product will naturally be largely regulated by its carbonate of lime content.

CRUSHED CLAM SHELLS.

Laboratory No 20474.—This material, it is stated, is manufactured and sold in New Brunswick for agricultural purposes. The sample analysed was forwarded for examination by a correspondent in Lower Woodstock, N.B.

Analysis—	Per Cent.
Mineral matter insoluble in acid	5·82
Oxide of iron and alumina	1·82
Carbonate of lime	81·30
Organic matter, etc., undetermined	11·06
	100·00

Mechanical analysis—	Per Cent.
Passes 12-mesh screen	97·50
" 50 "	0·50

The essential constituent of this material is carbonate of lime. It would be valuable for sour soils and those generally needing lime, but it is not sufficiently finely ground to be immediately effective. It is too coarse to be generally recommended, but no doubt could be profitably used if the price were correspondingly low.

WASTE LIME FROM MANUFACTURE OF WOOD ALCOHOL.

Laboratory No. 19433.—This material, as received, was of a yellowish-brown colour, somewhat moist, and with an odour of pyroligneous acid. It was forwarded from Monte Bello, Que., with a request for information as to its agricultural value.

Analysis—	Per Cent.
Water, at 212° F.	15·76
Loss on ignition, organic matter, etc.	8·17
Mineral matter insoluble in acid	7·46
Oxide of iron and alumina	9·71
Lime	36·88

This waste lime effervesces strongly on the addition of an acid, showing that a part of the lime at least is present in the form of carbonate. The partial conversion into carbonate may be due to exposure of the material to the air subsequent to its use in the manufacturing process.

There appears to be no reason why this waste or by-product could not be used as a source of lime for treating land, but it would be a useful precaution to expose the material on the surface of the land for some little time before harrowing it in.

WASTE LIME FROM BEET SUGAR FACTORY.

Laboratory No. 17078.—This sample of refuse lime was received in an air-dried condition as a friable, greyish-white mass; fresh from the factory it would contain a large percentage of water, which would necessarily reduce its lime content. The analysis was made at the instance of the Commission of Conservation, Ottawa.

Analysis—	Per Cent.
Moisture	3·33
Organic and volatile matter	14·13
Mineral matter insoluble in acid	0·86
Oxide of iron and alumina	3·44
Lime (CaO)	43·88
Magnesia (MgO)	1·88
Potash and soda (as chlorides)	0·84
Phosphoric acid (P_2O_5)	0·94
Sulphates (SO_3)	1·17
Carbon dioxide (CO_2)	29·54
	100·01
Nitrogen, in organic matter	·386

This material is essentially hydrate and carbonate of lime, and consequently would be found a useful amendment for all soils deficient in this element. In its air-dried condition it would appear to be a convenient and suitable form in which to apply lime to the soil.

In addition to the lime compounds it contains some 15 per cent of organic matter, holding ·386 per cent of nitrogen. This nitrogen, in all probability, would become available more or less readily for crop use. The product has, therefore, a certain small value as a nitrogenous manure.

Potash and phosphoric acid are present in amounts which, though not sufficiently large to be noted commercially, nevertheless, like the nitrogen, add to the agricultural value of the product.

INDURATED MARL.

Laboratory No. 19146.—From Sardis, B.C. This is a hard, rock-like material with a honeycombed structure. It occurs by deposition from the waters of streams and springs which are rich in carbonate of lime. Large deposits of this material occur in many of the valleys of British Columbia, and previous analyses have shown its composition as almost pure carbonate of lime. The present sample is no exception, and must be considered as a species of marl of excellent quality. If crushed it would be found a very useful source of lime for soils deficient in this element.

MARL.

Laboratory No. 17521.—From a large bed or deposit near Drummondville, Que. Analysis showed it to be of excellent quality, consisting essentially of carbonate of

lime. Its condition would permit of its easy application to the soil, being soft and friable. It would constitute an admirable material for soils that would be benefited by liming.

SOFT WOOD ASHES FROM MILL.

Laboratory No. 17724 A and B.—These ashes are from the furnace of a lumber mill in which waste wood is burnt, at Isle Verte, Que., and, as reported, they are thrown into a heap, exposed to the weather, or got rid of by throwing them into the river. Our correspondent stated that they could be obtained by farmers of the locality for the hauling, and wished to know if they were of any agricultural value, especially for sandy soils. Hitherto they had not been used, probably because their fertilizing value was unknown.

"A" Fresh ashes, as received, was in the form of a dry grey ash, with some fragments of charcoal.

"B" Exposed ashes, as received, was a greyish white mass of an earthy or ash-like appearance, quite moist, with some fragments of charcoal.

Analysis—	"A." Per Cent.	"B." Per Cent.
Water	0·36	30·81
Mineral matter insoluble in acid, clay, sand, etc	56·35	25·05
Organic and volatile matter, charcoal, etc	11·60	13·03
Lime, chiefly as carbonate	19·98	10·38
Phosphoric acid	0·64	0·82
Potash	1·91	0·85

Since the chief fertilizing element of value in these ashes is potash, sample "A" is much the better of the two. Further, this sample is richer in lime. Weight for weight, it would be approximately double the value of "B," which evidently has been seriously leached.

These ashes would undoubtedly be of very considerable value to sandy loams. The folly of allowing the ashes to be exposed to the weather is well shown by the analyses. They should be gathered while fresh, and kept protected from rain and snow until the farmer is ready to use them on his land. They would be found useful on sour soils and all those deficient in lime, and would be found more particularly useful for clover, alfalfa, roots, corn, and fruit trees.

For the purpose of comparison, it may be stated that good quality ashes from hardwoods contain from 4½ to 6½ per cent potash, and 1 to 2 per cent phosphoric acid.

Laboratory No. 19543.—This is a further sample of soft-wood ashes, and was produced by the refuse burner of a large mill near Bathurst, N.B. As received, the sample was fairly dry, of a greyish-brown colour, and contained a considerable amount of charcoal. There was apparently little or no admixture of clay or sand.

Analysis—	Per Cent.
Moisture	7·50
Organic and volatile matter, chiefly charcoal	23·04
Mineral matter insoluble in acid	14·98
Oxide of iron and alumina	12·72
Lime, chiefly as carbonate	23·79
Phosphoric acid	1·59
Potash	0·28

The value of these ashes as a potassic fertilizer is practically nil. The very low potash content points to the conclusion that the ashes have been very seriously leached. It is impossible to suppose that this sample represents the furnace ashes as produced. However, as analysed they have an agricultural value, chiefly for the lime they contain, and they no doubt would prove a useful amendment for soils in need of this element.

SOFT MAPLE ASHES.

Laboratory No. 16648.—Forwarded from Sardis, B.C., and stated to be from an ordinary "box" stove in which soft maple was being burnt. The sample was in the form of a clinker, having been fused.

Analysis—	Per Cent.
Mineral matter insoluble in acid	3·16
Lime, chiefly as carbonate	35·76
Phosphoric acid	2·71
Potash	19·19

These ashes contain an unusually high percentage of potash and, in consequence, possess a very considerable fertilizing value. We have not been able to find any record of the composition of the pure ash of soft maple, which we presume this is, so that we cannot say if these data are in any degree abnormal The analysis was carefully carried out, and there is no reason to doubt the accuracy of the results. At the present time, when the ordinary potash compounds have disappeared from the market, this analysis is of peculiar interest.

INCINERATOR ASHES.

Laboratory No. 17089.—From the city incinerator at Peterborough, Ont., and stated to be the fine ash obtained by screening the crude ashes.

Analysis—	Per Cent.
Moisture	3·48
Organic and volatile matter	10·73
Mineral matter insoluble in acid	48·62
Lime[1]	14·08
Phosphoric acid	1·87
Potash	1·75
Nitrogen	·192

[1]Equal to carbonate of lime, 25·14.

Incinerator ashes, as has been shown by previous analyses, are extremely variable in composition; very considerable differences have been found, week by week, in ashes from the same incinerator. The sample here reported on is one of the best, so far as potash is concerned, that we have examined; its agricultural value, nevertheless, is not high, and would not approximate that of good wood ashes. It could, however, be advantageously employed on many classes of soils, especially those in need of liming, provided it could be obtained at a sufficiently low cost.

PEAT ASHES.

Laboratory No. 18123.—These resulted from the burning of a deposit of peat from 6 inches to 1 foot in thickness, in the clearing of land near Aylmer, Que. As received they were a fine, dry, ash-like powder.

Analysis—	Per Cent.
Moisture	0·82
Mineral matter insoluble in acid	60·74
Oxide of iron and alumina	16·24
Lime, chiefly as carbonate	11·10
Phosphoric acid	1·56
Potash	0·38
Undetermined, charcoal, carbonic acid, etc	9·14
	100·00

Previous analyses of peat ashes resulting from the clearing of land furnished the following data, inserted here for the purpose of comparison.

	A. Per Cent.	B. Per Cent.	C. Per Cent.
Moisture	0·77	3·02	
Mineral matter insoluble in acid	77·83	73·55	
Oxide of iron and alumina	7·46	3·89	
Lime	6·40	7·00	21·75
Phosphoric acid	0·39	0·57	1·68
Potash	0·30	0·51	0·60

Though not equal to good wood ashes, either in potash or phosphoric acid, these peat ashes undoubtedly possess a very considerable fertilizing value, especially for light upland soils with a tendency to sourness through deficiency of lime, and for soils containing an abundance of vegetable matter.

SMELTER SLAG.

Laboratory No. 19693.—This is a sample of the slag from the smelter at Nelson, B.C. Our correspondent says: "Large quantities of this slag are available, and presumably the only expense would be transportation. If, like basic slag, it has any fertilizing properties, the information would be of interest and value to this community."

Analysis—	Per Cent.
Silica	35·24
Oxide of iron and alumina	47·24
Lime	12·55
Phosphoric acid	·08
Potash	0·46

The amounts of plant food present are not such as to impart to the material any substantial value, and there are no indications that this slag could be put to any agricultural use, save perhaps for the lightening of heavy clay soils.

STONE MEAL.

Laboratory No. 18230.—The analysis of this material, manufactured by the Stonemeal Fertilizer Company, of North Patterson, N.J., was undertaken at the solicitation of the Commission of Conservation, Ottawa, to whom it had been sent for experimental purposes.

It is in the form of a very finely ground grey powder, insoluble in water. It effervesces strongly on the addition of acid, giving off carbon dioxide and sulphuretted hydrogen.

Under the microscope it is seen to contain particles of mica, quartz, and feldspar. Apparently it is a mixture of finely ground rock material, including apatite or native phosphate of lime.

Analysis—	Per Cent.
Mineral matter insoluble in acid	44·42
Lime, present as carbonate, sulphate and phosphate	19·00
Magnesia	4·43
Potash	0·30
Phosphoric acid	5·55

It does not contain any immediately soluble and available plant food, and hence could not be classed as a fertilizer. Its only fertilizing constituent in notable amount is phosphoric acid, and this, by reason of its insoluble condition, would practically be of no immediate value to crops. It might be argued, of course, that this phosphoric acid would gradually become soluble and useful; in admitting this conclusion it may be pointed out that the conversion would be extremely slow. There is no reason to suppose that the change would be more rapid than that which takes place ordinarily in the

reduction of the soil's natural stores of this element, and the response in crop returns from its use as a phosphatic fertilizer would, we are sure, in the majority of cases be unnoticeable.

Possibly the material might exert a beneficial influence on the tilth of some soils by virtue of its carbonate of lime content.

POTASH FERTILIZER FROM FELDSPAR.

Laboratory No. 20097.—This product, made by heating together, in a blast furnace, feldspar, limestone, and iron ore, in suitable proportions, was forwarded from Queen's University, Kingston, Ont., with a request for a report as to its value as an agricultural source of potash. The process employed seeks to render soluble and available the insoluble and inert potash of the feldspar. It is further stated that lime, magnesia and other elements of plant food are thereby furnished in a soluble condition. The sample submitted was from a preliminary trial on a comparatively small scale and, in consequence, may not be entirely representative of the product as manufactured in commercial quantities and finally put on the market.

The examination of this material (which was in the form of fine powder) made in the Farm laboratories, was of a careful and exhaustive character, and had in view the determination of its potash content and more particularly the ascertaining of the probable availability for crop use of this potash, for, from the agricultural standpoint, the value of this product would depend entirely upon its percentage of available potash.

The solvents used in extracting the potash from the product were water, dilute citric acid, dilute hydrochloric acid, and strong hydrochloric acid, and the following data were obtained, the analysis being made in duplicate and, in some determinations, in triplicate.

Analysis—

Solvent—	Potash (K_2O) Per cent
Water	.048
	traces.
Citric acid, 1 per cent solution	3.16
	3.34
	3.15
Hydrochloric acid, sp. gr. 1.115	4.40
	4.43
Hydrochloric acid, strong	5.41

These data indicate the total amount of potash that may be considered as possibly in time becoming available (5.41 per cent), and the percentage of potash that might be viewed as of more or less immediate availability (3.34 per cent).

The potash, as found in this product, exists no doubt largely as silicates, regarding the availability or usefulness of which for plant nutrition there is very little on record. Some years ago, experiments were made in Germany with a crude potassium silicate, but the material was not put on the market, and inquiries concerning it were unsuccessful in eliciting any information as to the reason. It would seem, therefore, that field trials with this product would be necessary to establish its agricultural value.

The potash compounds used ordinarily in fertilizers, the muriate and sulphate, are easily and entirely soluble in water; the water-soluble potash in this material is present in traces only.

The citric-soluble potash, amounting to about three-fifths of the total potash present, or 3·21 per cent, is undoubtedly more or less available; the degree of availability, however, for the reason given in a preceding paragraph, would have to be determined by practical field tests, carried on possibly for a number of years.

Dilute hydrochloric acid extracts in the neighbourhood of 4·0 per cent potash, practicaly 1·0 per cent more than that taken out by dilute citric acid. The availability of this additional percentage is doubtful, but it is probably higher than that present in the potassic minerals generally found in soils.

From our knowledge of soils and plant requirements, the contention that this product has an additional value from the presence of soluble silicates of lime, magnesia, soda, and iron, carries little or no weight. Their value for increasing crop yields is purely conjectural; indeed the evidence of agricultural chemistry to-day is against attaching any importance to these compounds as fertilizers. The only exception might be lime, which, in the form of oxide and carbonate, is a well known amendment for certain classes and conditions of soils.

Probably this process of treating feldspar may be further perfected. Potash feldspar, known as orthoclase, exists in large deposits in several parts of Canada. It contains from 10 to 12 per cent of potash. If this can be made available for agricultural use at a reasonable cost, a profitable industry could, no doubt, be established at the present price of potash. It seems safe to conclude, however, that once the European war is over, the supply of potash compounds from the Stassfurt mines will again be available and the price of potash recede to that of *ante bellum* days. This event, it is probable, would make the commercial operation of such a process as the one here discussed, very difficult, if not impossible.

SPENT BONE.

Laboratory No. 16812.—This is a refuse or waste product from the glucose factory, being bone char or animal charcoal, after use in the purification of the syrup.

Analysis—	Per Cent.
Moisture	0·67
Mineral matter insoluble in acid	0·94
Phosphoric acid	30·30
Nitrogen	0·97

The phosphoric acid is equivalent to 66·15 per cent of bone phosphate.

This material is rich in phosphoric acid, and also contains a notable percentage of nitrogen. Unfortunately, its decay in the soil is very slow and the process whereby its constituents become available for crop use is, as a consequence, very gradual. For this reason it is seldom used in its untreated condition, but is more commonly employed for the manufacture of superphosphate.

DOG FISH SCRAP.

Laboratory No. 16975.—This is a sample of the product from the Dogfish Reduction Works at Canso, N.S. It is essentially a nitrogenous fertilizer, though also possessed of a notable amount of phosphoric acid and a little potash.

Analysis—	Per Cent.
Moisture	8·09
Nitrogen	9·46
Phosphoric acid	3·16
Potash	0·93
Total mineral matter (ash)	7·53
Oil	26·69

This fish scrap or refuse has been repeatedly analysed in the Farm laboratories, and the results published in the reports of this Division. The present data do not differ markedly from those previously obtained, though the nitrogen content is slightly above the average.

Although the nitrogen in this material cannot rank in availability with that of nitrate of soda or sulphate of ammonia, this product is undoubtedly a valuable nitrogenous fertilizer. The response from its use will depend largely on the character of the soil and of the season, and it would seem probable in many cases that its effect will be more noticeable on the crop of the second or even third year after its application than upon that of the season in which it is applied. It would be best suited to moderately light, warm, moist soils. If it could be prepared with a smaller percentage of oil, the constituent which retards its decay in the soil, the availability of its nitrogen would undoubtedly be more rapid.

POND MUD.

Laboratory No. 13922.—This fresh-water deposit, containing a few small shells and consisting essentially of clay or silt and fine sand, with a certain admixture of organic (vegetable) matter, was forwarded from Souris East, P.E.I. The correspondent writes: "Would this be of any value for poor land? I thought of using it as a top dressing on sod land, and also for potatoes and oats. My soil is a heavy clay."

In the air-dried condition its analysis afforded the following data:—

Analysis—	Per Cent.
Moisture	2·65
Mineral matter insoluble in acid	71·77
Oxide of iron and alumina	8·61
Lime (present as carbonate)	1·08
Phosphoric acid	0·28
Nitrogen, in organic matter	0·422

Though not very valuable, this deposit undoubtedly would be found of some benefit to poor land. It contains a certain amount of organic matter, and this holds a small proportion of nitrogen. It also possesses about 2·0 per cent of carbonate of lime. All these, though small in amount, should improve the soil. Other elements of plant food are present in practically negligible quantities.

It must not be expected that a deposit of this character can take the place of manure in the up-keep of fertility, nor can it be regarded as allied to fertilizer materials which furnish notable amounts of available nitrogen, phosphoric acid, and potash. It is rather an amendment, which, from its general character, may be expected to be of more service to sandy loams than to clays. Trial only will show its value, as much will depend upon its influence on the texture of the land to which it is applied. We could not advise going to any great expense in obtaining this "mud" before ascertaining, on a small scale, its effect; and we think it would be advisable to expose the deposit to the air for some weeks before working it into the soil, for, as dug, it appears to be somewhat sour, in spite of its small content of carbonate of lime. This exposure would also correct the injurious effects of any sulphur compounds that are likely to be present.

"MUD" FROM MIRA RIVER, CAPE BRETON, NOVA SCOTIA.

Laboratory No. 16993.—This sample was taken from the bed of the Mira river in Cape Breton, 10 miles from salt water. "The deposit is about 10 feet thick. If of any fertilizing value, large quantities could be readily and cheaply obtained by the farmers in the neighbourhood. The analysis and report as to its use and value may mean a great deal to the people of the Mira river."

This "mud" upon exposure dries to a dark-grey mass, which can be readily broken, forming small, irregular fragments, the fractured surfaces indicating a fair amount of vegetable matter. Microscopical examination shows that the basis of this mud is largely fine sand and silt; there is apparently very little clay present.

The dried and prepared sample was submitted to analysis, and the following results obtained:—

Analysis—	
Moisture	4.25
Organic and volatile matter [1]	28·70
Mineral matter insoluble in acid	58.80
Oxide of iron and alumina	7.59
Lime	.84
Potash	.25
Phosphoric acid	.19
	100.62

[1] Containing nitrogen .751

In its essential features, both physically and chemically, this "mud" resembles many samples of river deposits from the Maritime Provinces that have been analysed in the Farm laboratories. It cannot be regarded as in the same class with commercial fertilizers, for its percentages of the essential elements of plant food are not large; but there can be no doubt of its value for the improvement of poor soils, and more particularly those deficient in nitrogen and organic matter. Its chief constituent of fertilizing value is nitrogen, which is associated with the organic matter present.

This nitrogen would slowly become converted in the soil into forms available for crop growth, and thus lead to increased production. The percentages of lime, potash and phosphoric acid are not larger than those found in ordinary good soils, but we may well conclude, from experimental work done on similar materials a few years ago, that these elements exist in a condition of comparatively high availability, though not so available as in the forms found in commercial fertilizers.

The physical condition of the mud would be, we believe, an important factor in its possible effect on soils, and we should expect the best results to be obtained from its applications to fairly heavy loams. To sum up, this material is not a fertilizer, strictly so-called, but may be considered as an amendment, chiefly of value for soils deficient in organic (vegetable) matter, and which are, in consequence, poor in nitrogen. It cannot be depended upon exclusively for the up-keep of the fertility, but could no doubt be profitably used in the building up of poor soils, if cheaply obtained. Its most notable feature, compared with other river muds that have been examined, is its comparatively high nitrogen content, and it is this fact that gives it its chief value from the fertilizer point of view.

MUCKS AND PEATS.

We are constantly receiving samples of black muck, peat, and similar materials for examination and report, either as to fertilizing value, if used as a manure, or the possibility of successful reclamation for cropping of the area covered by the deposit. In former years these, for the most part, have been analysed, the data appearing, with deductions, in the annual report of this Division. During the past year the time at our disposal has not permitted a quantitative analysis of the samples sent in, but as far as possible they have been examined qualitatively and reported on to the senders. In spite of our best endeavours, however, in this matter, there still remain a considerable number of samples of this character awaiting our attention.

FODDERS AND FEEDING STUFFS.

This chapter includes the analyses of a number of "feeds" used in feeding experiments with dairy cows, sheep and swine conducted by the Division of Animal Husbandary at the Central Experimental Farm, Ottawa. It also contains the analyses of forage crops used in feeding trials at certain of the Branch Farms and Stations.

Further, the composition, as ascertained in the Farm laboratories, is given of a number of feeds of a more or less miscellaneous character, sent in during the year for information as to their nutritive value.

In these days of high prices of nearly all classes of mill feeds and milling products, it is important for true economy that the farmer should be able to compare the feeds offered, not only as to price per ton but also as to composition, more particularly as to protein and fat content. The data and information here given therefore should prove of considerable interest to dairymen, stock raisers and indeed to all farmers. This subject is one that merits closer attention than it has received in the past.

GROUND OATS.

Laboratory Nos. 19651 and 20421.—These oats were ground and fed on the Central Farm, Ottawa, in 1914. From experiments made in 1908 we found that, in mature,

well-ripened oats, the proportion of kernel to hull was considerably higher than in oats caught by the frost while still immature. This fact naturally makes the immature "light weight" oats the poorer feed, compared weight for weight with plump, mature oats.

Sample No 19651, while not ranking with the best quality oats, approaches closely the average obtained from the analysis of a number of good grade oats. Sample No. 20421 is evidently from oats of the first quality, and is exceptionally high in protein and fat.

Analysis of Oats.

Constituent.	No. 19651.	No. 20421.	Banner Oats, best quality	Average from many sources.
	Per cent.	Per cent.	Per cent.	Per cent.
Water	8·44	10·95	12·74	10·4
Protein	10·35	13·53	11·22	11·4
Fat	4·73	6·11	4·82	4·8
Carbohydrates	61·65	56·08	58·84	59·4
Fibre	11·23	10·32	9·47	10·8
Ash	3·60	3·01	2·91	3·2
	100·00	100·00	100·00	100·00

It may be of interest to note that, on an average, oats contain somewhat less protein and are decidedly richer in fat than wheat; compared with corn they are much richer in protein, with an almost equal percentage of fat.

Though oats occupy the first place among the cereals in stock feeding, barley is recognized by those who have had experience with it, as closely following; especially are its merits valued in pork production and as a constituent in the ration of the dairy cow. The practice, now becoming common, of sowing barley and oats together for grain for feeding is one that not only gives excellent yields but also furnishes, in the mixed ground grain, a meal palatable and nutritious, and one eminently suitable for many classes of stock.

OAT FEED.

Laboratory No. 20199.—This feed was forwarded by a correspondent in Sawyerville, Que., and stated to be an output of the Quaker Oat Company, the results of grinding the small and light oats that are rejected in the manufacture of oatmeal. The local selling price was $23 per ton. Our correspondent asks how it would compare with bran at $29 per ton for milch cows.

Analysis—	Per Cent.
Moisture	3.20
Protein	7.70
Fat	2.77
Carbohydrates	58.63
Fibre	23.86
Ash	3.84
	100.00

The sample showed a large proportion of hulls and a small amount of fine meal. Its appearance would lead to the conclusion that it was a fibrous feed of low protein value, and the analysis confirms this opinion. It is a very poor feed, both in composition and digestibility, and certainly bran at $29 per ton would be much better value. This feed, in our opinion, is not worth $10 per ton. Bran contains on an average 15 per cent protein and 4·0 per cent fat, with not more than 9·0 per cent of fibre.

Laboratory No. 20553.—Sent by a correspondent in Simard, Que., where it sold locally as an "oat feed" without any guarantee. There is no information as to brand or manufacturer. As received it is a finely-ground meal.

Analysis—	Per Cent.
Water	4.80
Protein	6.48
Fat	2.47
Carbohydrates	52.62
Fibre	27.75
Ash	5.88
	100.00

This material is of extremely low feeding value, the analysis indicating that it consists esentially of oat hulls, the presence of which is masked by the fine condition to which the meal has been ground.

The practically worthless character of feeds of this class makes it extremely doubtful if they can be economically used at any price.

GROUND BARLEY.

Laboratory No. 18699.—This sample was taken from stock used in pig feeding experiments at the Experimental Farm, Agassiz, B.C. For the purpose of comparison we append the averages from the analyses of a series of Canadian and American-grown barleys.

ANALYSIS of Barley.

Constituent.	No. 18699	Average of Canadian-grown barleys.	Average of American-grown barleys.
	Per cent.	Per cent.	Per cent.
Analysis—			
Water	10·53	11·96	10·8
Protein	11·98	10·57	11·0
Fat	2·14	2·06	2·1
Carbohydrates	67·88	68·90	69·1
Fibre	5·19	4·10	4·2
Ash	2·28	2·41	2·5
	100·00	100·00	100·00

Compared with oats, from the standpoint of composition, the protein content of the two cereals, generally speaking, is very similar, though certain barleys grown specially for malting purposes possess less protein and more starch than oats. For feeding purposes, a barley rich in protein is, of course, to be desired. The fat content of barley is about one-half that of oats; in fibre, oats contain about twice as much as barley.

BRAN.

Laboratory No. 18216.—From stock obtained from the Ontario and Manitoba Milling Company, Ltd.

Laboratory No. 18226.—Taken from stock purchased from the Maple Leaf Milling Company, Ltd.

Laboratory No. 20422.—From stock purchased from the Ogilvie Milling Company, Ltd.

All three brands were used in experimental cattle feeding work at the Central Farm, Ottawa.

ANALYSIS of Bran.

Constituent.	No. 18216.	No. 18226.	No. 20422.
	Per cent.	Per cent.	Per cent.
Water	8·70	9·15	12·38
Protein	16·43	16·75	17·50
Fat	3·33	3·21	4·23
Carbohydrates	55·20	57·36	50·96
Fibre	8·58	7·64	9·47
Ash	7·76	5·89	5·46
	100·00	100·00	100·00

Our analyses of genuine Canadian brans made in 1903, on samples supplied by the larger milling companies in the Dominion, gave the following average data: protein, 14·52 per cent: fat, 4·37 per cent; fibre, 10·14 per cent. To meet the requirements of the Feeding Stuffs Act, a bran must contain not less than 14·0 per cent of protein, not less than 3 per cent fat, and not more than 10·0 per cent of fibre.

SHORTS.

Laboratory No. 19654.—This sample was taken from stock manufactured by the Canadian Cereal and Flour Company, Ltd., Toronto, and used in feeding experiments conducted by the Division of Animal Husbandry at the Central Farm, Ottawa. The price was $25 per ton.

Analysis—	Per Cent.
Water	8.23
Protein	17.19
Fat	6.02
Carbohydrates	55.31
Fibre	8.87
Ash	4.38
	100.00

Laboratory No. 18227.—From stock purchased from the Maple Leaf Milling Company, Ottawa.

Analysis—	Per Cent.
Water	9.51
Protein	15.04
Fat	4.32
Carbohydrates	60.09
Fibre	6.34
Ash	4.70
	100.00

Laboratory No. 18700.—This sample, forwarded from the Experimental Farm at Agassiz, B.C., was designated "Robin Hood" brand.

Analysis—	Per Cent.
Water	9.26
Protein	18.06
Fat	4.64
Carbohydrates	58.09
Fibre	6.18
Ash	3.77
	100.00

The Commercial Feeding Stuffs Act requires that feeds sold as shorts or middlings should contain not less than 15·0 per cent protein and 4·0 per cent fat, and not more than 8·0 per cent fibre. In 1909 we analysed a number of genuine shorts and obtained the following averages: protein, 15·93 per cent; fat, 5·24 per cent; and fibre, 5·23 per cent.

The shorts of to-day are practically a species of fine bran, differing markedly from the floury, mealy shorts of the old stone mills. Shorts, as we knew them before the introduction of the roller process of milling, are almost a feed of the past. This is to be regretted from the standpoint of the farmer who depended on the mealy shorts, in conjunction with skim-milk, for pig and calf feeding. For this purpose they were highly esteemed. The present-day shorts, though not as desirable for pigs and young stock, are, however, richer in protein and mineral matter, and consequently more valuable for milk production, muscle making and the development of the frame.

GROUND CORN.

Laboratory No. 19653.—This was purchased from a local miller and used in certain pig feeding experiments carried on during the summer and fall of 1914 at Ottawa. The price was $30.40 per ton.

Analysis—	Per Cent.
Water	11.59
Protein	9.40
Fat	5.01
Carbohydrates	70.96
Fibre	1.44
Ash	1.60
	100.00

This sample conforms to the standard for a meal from the entire grain; the analysis denotes a corn meal of excellent quality. As is generally recognized by stockmen, corn meal is very palatable and is much relished by farm animals in general. It is essentially a fattening food.

Laboratory No. 20424.—This is a corn meal ground at the Central Farm, Ottawa, from the variety known as Yellow Dent, which was purchased at 70 cents per bushel. It is one of the feeding stuffs used in experimental work by the Animal Husbandry Division.

Analysis—	Per Cent
Water	12.67
Protein	9.06
Fat	5.89
Carbohydrates	69.19
Fibre	1.64
Ash	1.55
	100.00

These data indicate a quality practically identical with that of No. 19653, just discussed.

GLUTEN FEED.

Gluten Feed is a by-product in the manufacture of starch and glucose from corn. It consists practically of all the parts of the corn kernel save the starch and the germ, the essential constituents being gluten meal—a highly nitrogenous product now seldom found on the market—and corn bran. It is a valuable concentrate, rich in protein and with a fair oil or fat content, and its somewhat loose mechanical condition no doubt aids in its digestion by the animal. It is much relished by stock, and is highly

esteemed by dairymen as one of the sources for increasing the protein in the ration of dairy cows.

Laboratory No. 18214.—Canada Starch Co., Cardinal, Ont.

Laboratory Nos. 19293-4.—Forwarded from Lennoxville, Que., brand and manufacturer not stated.

Laboratory No. 19351.—Canada Strach Co., Cardinal, Ont.

Laboratory No. 20418.—Canada Starch Co., Cardinal, Ont.

Samples Nos. 18214, 19351, and 20418 were taken from stock used in feeding experiments conducted by the Division of Animal Husbandry at the Central Farm, Ottawa.

The average composition of gluten feed, as obtained from American sources, is added for the purposes of comparison.

ANALYSIS of Gluten Feed.

Constituent.	No. 18214.	No. 19293.	No. 19294.	No. 19351.	No. 20418.	Average from American sources.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Water	6·41	5·96	5·65	7·70	9·25	9·2
Protein	25·54	26·44	29·74	26·79	24·12	25·0
Fat	1·90	2·43	2·02	2·84	5·23	3·5
Carbohydrates	58·[illegible]9	56·74	56·04	55·08	53·21	53·5
Fibre	6·74	7·56	4·59	6·39	7·38	6·8
Ash	·82	·82	1·96	·80	·81	2·0
	100·00	100·00	100·00	100·00	100·00	100·00

The Canadian product, it will be observed, compares very well with that of American factories in nutritive qualities; the differences tend to show that our gluten meal is a little richer in protein and somewhat poorer in oil. With the exception of No. 18214, which is low in oil, No. 19294, which is exceptionally high in protein, and No. 20418, which contains a percentage of oil somewhat above the average, the samples indicate a very fair uniformity in composition.

SUPERIOR CORN FEED.

Laboratory Nos. 18228 and 20423.—This is a by-product in the manufacture from the corn breakfast food known as White Hominy.

It was purchased from H. D. Marshall, Ottawa and cost $29.50 per ton.

ANALYSIS of Superior Corn Feed.

Constituent.	No. 18228.	No 20423.
	Per cent.	Per cent.
Water	6·98	9·84
Protein	11·16	11·53
Fat	6·61	8·66
Carbohydrates	69·57	63·02
Fibre	3·09	4·42
Ash	2·59	2.53
	100·00	100·00

The guarantee calls for protein 10·49 per cent and fat 8·18 per cent; our analyses show that the material supplied satisfactorily meets the requirements. In protein and fat content, this meal closely resembles corn bran, but in its fibre it is much lower—and this feature should make it the more nutritious and more desirable feed.

OIL CAKE MEAL.

Laboratory No. 19652.—This sample was from stock manufactured by Sherwin-Williams, Ltd., used in pig feeding experiments at Ottawa. The price was $37 per ton.

Analysis—	Per Cent.
Water	8·28
Protein	34·95
Fat	7·71
Carbohydrates	36·44
Fibre	7·85
Ash	4·77
	100·00

This analysis agrees very well with that of the meal obtained by the "old process," in which the linseed oil is extracted by pressure. By the "new process," in which the oil is extracted by fat solvents such as naphtha, a meal is obtained that is characterized by a somewhat higher percentage of protein (approximately 38 per cent) and a decidedly lower percentage (from 2·5 per cent to 3·0 per cent) of oil. It is generally considered that the old process meal is the better of the two, partly by reason of its higher oil content and partly perhaps because its protein is somewhat more digestible. It would seem that in oil cake meal we have a feeding stuff in which the oil or fat is worth more than protein, weight per weight.

NUTTED OIL CAKE MEAL.

Laboratory No. 20419.—This product is apparently ground linseed oil cake, and was purchased from Sherwin-Williams Company, Ltd. It cost $36 per ton It is in the form of a very fine meal and from its appearance and condition it would be judged a wholesome, palatable feed of high quality. The sample was taken from stock used in feeding experiments with dairy cows by the Animal Husbandry Division.

Analysis—	Per Cent.
Water	9·18
Protein	36·50
Fat	8·67
Carbohydrates	33·28
Fibre	7·45
Ash	4·92
	100·00

In both protein and oil this sample is decidedly superior to No. 19652, previously reported.

FORT WILLIAM OIL CAKE MEAL.

Laboratory No. 19292.—This feeding stuff, labelled as above, is not oil cake meal as generally recognized. It contains no linseed, and appears to consist largely of a corn by-product. The sample submitted to analysis was forwarded from Lennoxville, Que., where it was offered for sale, but with no particulars as to manufacture or composition.

Analysis—	Per Cent.
Water	4.95
Protein	16.18
Fat	9.52
Carbohydrates	59.17
Fibre	9.09
Ash	1.09
	100.00

It could not be learned if this product was sold under guarantee as to protein, fat, and fibre, as the law requires, but of this there can be no doubt—that the brand or name under which it was sold is misleading. Compared with true oil cake meal, which contains about 35 per cent protein, it is an inferior feed. Judged on its own merits, it would appear to be an acceptable material, with a protein content equal to that in good quality bran; indeed in composition, save for a higher percentage of fat, it much resembles that feed.

FLAX PRODUCTS.

Three samples of flax products obtained in the threshing of flax seed were forwarded from the Canadian Flax Mills, Limited, St. Catharines, Ont., with a request for a report on their feeding value.

Laboratory No. 20140.—Was prepared by grinding together the seed and bolls. "This meal contains all the seed and all the bolls obtained in the threshing operation."

Laboratory No. 20141 consists of the broken bolls or capsules of the flax seed, sometimes known as flax chaff. The sample contains a small proportion of small and shrivelled flax seed, and a few fragments of flax stems or straw.

Laboratory No. 20142 is flax shives or fragments of broken flax straw.

ANALYSIS of Flax Products.

Constituent.	No. 20140.	No. 20141.	No. 20142.
	Per cent.	Per cent.	Per cent.
Water	5·62	5·81	6·25
Protein	31·50	16·34	3·65
Fat	19·39	16·26	1·32
Carbohydrates	18·66	28·67	26·31
Fibre	20·19	28·90	60·85
Ash	4·64	4·02	1·62
	100·00	100·00	100·00

We do not know of any experimental or other work in the feeding of a meal produced by the grinding together of the flax seed and bolls, but the present analysis (No. 20140) would indicate a material with notable amounts of protein and fat. These in themselves would make the feed one of high feeding value, but unfortunately they are associated with a very considerable amount of fibre, an undesirable component, when in excessive quantities, in concentrated feed stuffs. To what extent this fibre might affect the digestibility of the protein and fat we cannot say, but the data obtained on the present sample would indicate that this material is worthy of trial.

The sample of flax bolls (No. 20141) would appear to contain a considerable proportion of flax seed, which undoubtedly is the source of the comparatively high protein and fat percentages found in this product. The percentage of fibre is higher than in the material discussed in the preceding paragraph, amounting to nearly 30 per cent,

and this fact makes it difficult to pronounce upon the feeding value of this product. We are of the opinion that the high fibre content would materially depress its nutritive qualities. Feeding experiments would be necessary to establish its worth.

The analysis of the sample of flax shives (No. 20142) indicates a very poor feed—one very low in protein and fat, with an excessive amount of fibre. Furthermore, it would be unpalatable and possibly injurious by reason of its coarse, harsh, and brittle nature. It could not be used, in our opinion, for feeding purposes.

SOJA BEAN CAKE.

Soja or Soy bean cake is a palatable product especially rich in protein and therefore of high feeding value. Judiciously used in the ration, it may, if price is favourable, be fed to advantage in the place of cottonseed cake or linseed cake, for milk production. Experiments conducted in England, Germany, and the United States all go to show that this material is a concentrate of very considerable worth, especially for dairy cattle, and that no harmful results follow its use when fed in amounts not exceeding 5 pounds per day.

Laboratory No. 17729.—This sample, labelled Soja bean cake was forwarded from New Westminster, B.C., with the statement that it was imported by Messrs. Kasai & Co., a Japanese firm with head office at Osaka, Japan. It comes in cakes weighing about 60 pounds each, and the price is $35 per ton f.o.b. Vancouver wharf.

Analysis—	Per Cent.
Moisture	8.04
Protein	38.76
Fat	7.95
Carbohydrates	35.45
Fibre	3.21
Ash	6.59
	100.00

From these results we conclude that it would prove a valuable feeding stuff. It is very rich in protein and contains a notable percentage of oil or fat, with a low fibre content; in these features it ranks well with the best concentrates. Provided that it is found palatable, and no fear is expressed on that score, it could be used to advantage in the meal ration.

COTTON SEED MEAL.

A number of samples of this well-known concentrate have been analysed during the year, the data obtained being as follows:—

ANALYSIS of Cotton Seed Meal.

Constituent.	No. 18218.	No. 20126.	No. 20426.	No. 20550.	No. 20551.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Water	5·78	....	8·33	5·58	6·05
Protein	43·52	42·87	43·50	43·95	43·20
Fat	7·08	10·78	8·23	6·60	8·89
Carbohydrates	29·61	....	23·75	27·99	25·91
Fibre	6·93	....	9·65	9·65	8·79
Ash	7·03	....	6·54	6·32	7·26
	100·00		100·00	100·00	100·00

Laboratory Nos. 18218 and 20426 are from stocks used in cattle feeding experiments at the Central Farm, Ottawa. The brand is "Michigan Farmers' Brand" sold by J. E. Bartlett and Co., Jackson, Mich., U.S.A., and the guarantee of which is as follows:—

	Per cent.
Protein	41 to 46
Oil	7 to 12
Crude fibre	6 to 10
Carbohydrates	20 to 30

The price was $34.50 per ton.

The meal supplied meets the guarantee and is to be regarded as of excellent quality.

Laboratory No. 20126 is the "Pioneer Cotton Seed Meal," sold by J. E. Soper Co., Boston, Mass., and guaranteed to contain: Protein, not less than 41 per cent; fat or oil, not less than 7 per cent.

Our analysis shows that the guarantee has been complied with and that it is a cotton seed meal of high grade.

Laboratory Nos. 20550-1 were forwarded for examination without any information as to brand or guarantee. The analyses indicate meals of practically equal feeding value of very good quality.

Genuine cotton seed meals are of a bright yellow colour, while inferior grades are much darker, and show, on close inspection, fragments of hull intermixed with the fine meal. Since very considerable variation in composition is found in cotton seed meals on the market, the importance of purchasing this feeding stuff on guaranteed analysis will be obvious.

PEANUT OIL MEAL.

Laboratory No. 20634.—Peanut cake is a by-product in the manufacture of oil from the peanut. The meal is prepared by grinding the cake, or is ground peanut after the extraction of the oil by solvents. The sample analysed is from the stock used in cattle feeding experiments conducted by the Animal Husbandry Division at Ottawa. It was manufactured by the Oil Seeds Company, Bayonne, N.J., and cost in Canada approximately $40 per ton.

ANALYSIS of Peanut Oil Meal.

Constituent.	No. 20634.	Average from American sources.
Water	4·45	10·7
Protein	42·89	47·6
Fat	6·49	8·0
Carbohydrates	32·89	23·7
Fibre	4·30	5·1
Ash	8·98	4·9
	100·00	100·00

This product, though well known in the United States and European countries, has not yet been widely used in Canada. From its high protein content, which gives it a place among the richest concentrates on the market, and its palatability, it is undoubtedly a valuable feeding stuff, especially for cattle. Economy in its employment would, however, be determined by its price as compared with other concentrates on the market. It is sold under a guarantee of not less than 40 per cent protein, not less than 7 per cent fat, and not more than 7 per cent fibre.

RICE MEAL AND RICE POLISHINGS.

Laboratory Nos. 17317, 18701 and 17352.—These rice products were forwarded from the Experimental Farm, Agassiz, B.C., where they were being used in feeding tests with swine and poultry. The meal was obtained from the Imperial Rice Milling Co., Vancouver, B.C., and the polishings were purchased from the Grain Growers' Agency at New Westminster, B.C. Rice meal, No. 18701, bears no brand or distinguishing mark.

Analysis of Rice Meal and Rice Polishings.

Constituent.	Rice Meal.		Rice Polishings
	No. 17317.	No. 18701.	No. 17352.
	Per cent.	Per cent.	Per cent.
Moisture	9·88	10·62	11·85
Protein	12·96	11·70	12·16
Fat	14·89	9·02	9·02
Carbohydrates	52·23	59·39	56·35
Fibre	3·01	3·14	3·36
Ash	7·03	6·13	7·26
	100·00	100·00	100·00

Rice meal, when genuine, is generally considered a very nutritious and wholesome feed, rich in digestible protein and fat. Sample No. 17317 has afforded data for protein and fat slightly above the average, and is further characterized by a somewhat lower fibre content than is usually found in this product.

Rice polishings is " composed of the floury particles which result from polishing the kernels to produce a pearly lustre." Comparing these data with those from American sources, this sample appears to be of a somewhat inferior quality. It will be observed to differ but very little from the rice meal samples here discussed.

Rice meal in a mixed grain ration and fed with skim-milk is reported from several of the United States Experiment Stations as giving good returns in pig feeding. It is considered by some experimenters as equal to corn meal when used judiciously. Rice polishings have also been employed in pig feeding, with somewhat poorer results.

SWIFT'S DIGESTER TANKAGE.

Laboratory No. 19650.—Tankage, a by-product of the packing house, is usually characterized by a very high percentage of protein and a considerable fat content. It frequently contains a notable amount of earthy phosphates from the presence of bone. It has found its chief use in feeding pigs and poultry, but can also be employed in limited quantities in cattle and sheep feeding. Owing to its highly nitrogenous character it must be used with discretion in the ration. There are many inferior brands on the market, containing hair, hoof, and other material worthless from the feeding standpoint. Particular care should be taken in purchasing tankage and meat meals to see that they are perfectly sound and free from foreign matter of a worthless or harmful character.

Analysis—	Per Cent.
Water	13.15
Protein	59.35
Fat	9.55
Carbohydrates	.33
Fibre	2.69
Ash	14.93
	100.00

From its condition and composition as revealed by analysis, this sample ranks with brands of the best quality.

HARAB TANKAGE.

Laboratory No. 18225.—From the Harris Abattoir Ltd., Toronto.

Analysis—	Per Cent.
Water	6.85
Protein	62.89
Fat	7.60
Carbohydrates	3.38
Fibre	2.42
Ash	16.86
	100.00

This differs mainly from No. 19650 in a somewhat higher percentage of protein and about 2 per cent less fat. It is representative of a first-class grade of tankage.

FISH SCRAP.

As in the case of meat wastes, so fish wastes—and frequently the entire fish—are prepared for use in stock feeding. From fish oil and glue factories many products more or less rich in protein are put upon the market. Some of these are of low grade and valuable only as fertilizers, being unsuitable by condition or composition for stock. On the other hand, there are certain brands of refined and carefully selected material, sound and sweet, that may be safely and legitimately employed as one of the sources of protein in the ration. The classes of stock for which these "scraps" are more particularly used are pigs and poultry. Many of the brands specially prepared for the latter possess very considerable amounts of bone phosphate, a constituent generally held to be useful in egg production.

Laboratory Nos. 16132-3.—These samples of "fish scrap" were submitted by the Ottawa Poultry Association with a request for a report upon their usefulness in poultry feeding. They are the product of the International Glue Co., Boston, Mass., and are labelled Blue Ribbon Fish Scrap, "coarse" (No. 16132) and "fine" (No. 16133).

ANALYSIS of Fish Scrap.

Constituent.	No. 16132.	No. 16133.
	Per cent.	Per cent.
Moisture	6·23	5·44
Organic matter	67·75	57·66
Mineral matter insoluble in acid	25·62	36·39
Mineral matter soluble in acid	·40	·51
	100·00	100·00
Phosphoric acid	10·71	14·72
equivalent to bone phosphate	23·46	32·34
Nitrogen	9·24	8·04
equivalent to protein	57·76	50·25
Fat	2·28	2·63

The essential differences between these two brands, apart from mechanical condition, lie in their percentages of protein and phosphate of lime. The "coarse" is the richer in protein and the poorer in bone phosphate. The percentages of fat are practically identical, and very low, which seems to the writer a feature generally desirable in scraps for poultry feeding.

Laboratory No. 11268.—Dogfish scrap from the Dogfish Reduction Works, Canso, N.S. This is sold for fertilizing purposes only, but the present analysis was made at the request of the Ottawa Poultry Association, with a view of determining its suitability for use in poultry feeding.

Analysis—	Per Cent.
Moisture	8.44
Organic matter	83.40
Mineral matter, soluble in acid	7.69
" insoluble in acid	.47
	100.00
Phosphoric acid	2.88
equivalent to bone phosphate	6.28
Nitrogen	8.89
equivalent to protein	55.56
Fat or oil	24.72

Though comparatively rich in protein it is low in phosphates. Its use in poultry feeding is undesirable and probably unsafe by reason of its high oil content.

ALFALFA MEAL.

Laboratory No. 18703.—This is simply ground alfalfa hay. It is a product used in certain of the western United States, but so far has not been largely fed in Canada. The sample analysed is from stock used in feeding experiments at Agassiz, B.C.

Analysis—	Per Cent.
Water	9.42
Protein	14.08
Fat	2.22
Carbohydrates	39.99
Fibre	24.08
Ash	10.21
	100.00

Since the percentage of crude protein in the material approaches closely that of bran, it has been stated that these two feeds have practically the same nutritive value. This, however, is not the case; the alfalfa meal is much the inferior, for a large proportion of its crude protein is in the non-albuminoid form, ranking in nutritive properties not higher than the carbohydrates. In bran the protein is practically all in the form of the more valuable true albuminoids, the sole nutrient furnishing the supply of organic nitrogen necessary for the wants of the body.

FEEDING MOLASSES.

Laboratory No. 20425.—This is cane molasses from Louisiana, Mo., U.S.A., and is commonly known as blackstrap. It is a palatable and appetizing material, and in addition to its nutritive value, which is entirely dependent on its sugar content, is considered, when fed in moderation, to increase the digestibility of the other feeds used in the ration and to assist in keeping the animal in a healthy condition. In general feeding, and viewed simply as a furnisher of nutrients useful in the animal economy, molasses must be regarded as a sugar feed, supplying practically no protein or fat. Unlike beet-root molasses, the molasses from the sugar cane is not characterized by any bitter taste and, further, is comparatively free from those salts which give the former its excessive laxative properties when too liberally used. Molasses and molasses feeds have found their use more particularly in preparing animals for the ring, but in moderate quantities in a well-balanced ration they can be employed, if their prices are not excessive, in the daily feeding. The price of the molasses analysed was $23 per ton at Ottawa, which from the nutritive standpoint makes it a much cheaper form in which to use this material than most of the molasses feeds on the market.

Analysis—	Per Cent.
Water	28.12
Protein	4.69
Fat	....
Fibre	....
Carbohydrates (essentially sugars)	61.41
Ash	5.78
	100.00

MOLASSINE MEAL.

Laboratory No. 18217.—This is a manufactured product imported from England. The molasses it contains is apparently held by sphagnum moss, which is found to be an excellent absorbent for the purpose of presenting, in an acceptable and convenient form for feeding, a material (molasses) which by itself is more or less troublesome and disagreeable to use. The absorbent, moss, contributes nothing of feeding value. but counteracts, in a degree, the laxative effect on the system experienced when feeding molasses alone.

Molasses feeds, in general, are essentially sugar feeds. They are appetizing and thus useful in connection with the employment of certain more or less unpalatable roughages. They are to be valued simply by their sugar content, and sugar is an easily digested and assimilated nutrient of very considerable feeding value as an energy, heat, and fat producer. Feeds of this character furnish practically no protein and fat, the nutrients which the farmer specially looks for in the concentrates which he purchases to balance the ration made up essentially of home-grown feeds and fodders, and which are usually characterized by an excess of carbohydrates (non-nitrogenous nutrients). Molasses and molasses feeds as a class are stated to be useful, when used judiciously, in keeping the animal in a healthy and vigorous condition, to aid in the digestion of the ration and to act mildly in a medicinal way, by preventing constipation.

The sample analysed was from stock used in feeding trials by the Division of Animal Husbandry at the Central Farm, Ottawa, and cost $37 per ton.

Analysis—	Per Cent.
Water	19.16
Crude protein	7.61
Fat	.26
Carbohydrates (chiefly sugars)	59.36
Fibre	6.16
Ash	7.45
	100.00

As we have frequently pointed out, the market price of molasses feeds in general is considerably higher than appears to be warranted by their direct feeding value as revealed by analysis. That they may be legitimately and profitably used as "conditioners" there can be little doubt, but as feeds for economically supplying carbohydrates in the every-day ration, at present prices, their employment is open to question.

MOLASCUIT.

Laboratory No. 18213.—This product, imported from Demarara, British Guiana, is manufactured from cane molasses and the cells from the interior of the exhausted sugar cane, used as an absorbent to hold the molasses.

Analysis—	Per Cent.
Water	13.57
Protein	3.43
Fat	.39
Carbohydrates (chiefly sugars)	63.38
Fibre	8.83
Ash	10.40
	100.00

These data are in fair accord with the guarantee, and indicate a "sugar feed" of excellent quality. As with others of its class, it adds nothing to the ration in protein or fat. Its economic use, as we have pointed out in discussing feeds of this character, would be largely governed by its price. At the rates hitherto prevailing it is difficult to understand how many of the feeds of this character can be profitably employed in any quantities as a regular constituent of the ration.

CALDWELL'S MOLASSES MEAL.

Laboratory No. 20420.—This is manufactured by the Caldwell Feed Co., Ltd., of Dundas, Ont., and stated to be composed of 80 per cent to 84 per cent cane molasses and sphagnum moss. The latter is employed simply as an absorbent and to present the molasses in a convenient form for feeding, though it is held that the moss prevents any undue laxative effect following the use of molasses in large quantities.

Analysis—	Per Cent.
Water	21·12
Protein	5·10
Fat	·90
Carbohydrates (chiefly sugars)	59·90
Fibre	6·64
Ash	6·34
	100·00

This material compares very favourably as regards sugar content with the larger number of feeds of a similar nature upon the market, which, as we have already pointed out, are simply to be regarded as supplying readily digestible carbohydrates.

CALF MEAL.

Laboratory No. 20383.—Calf meals are preparations used as substitutes or partial substitutes for new milk in the feeding of young calves. The components of these feeds are many, including linseed meal, bean meal, shorts, low grade flour, oatmeal, corn meal, etc., Sugar or sugar products also are sometimes added to increase the proportion of readily assimilated carbohydrates, and small quantities of certain aromatic compounds for rendering the meal pleasant and palatable. From the large number of materials employed, and the varied proportions in which they are used, the composition and hence the nutritive value of any particular brand is a matter that must be specially determined. Few classes of feeds contain members differing so widely among themselves in nutritive value as that generally advertised as "calf meals."

The sample here reported was sent from Spencerville, Ont., the output of a local firm. Its components are stated as flaxmeal, buckwheat, shorts, cotton seed meal, low grade flour, and oatmeal.

Analysis—	Per Cent.
Water	8.94
Protein	24.44
Fat	13.85
Carbohydrates	44.91
Fibre	3.73
Ash	4.13
	100.00

In both protein and fat this meal must be considered as possessing high values, and the low fibre content would undoubtedly enhance its nutritive qualities for young stock. The presence of cottonseed meal, however, is most undesirable, for though this feed is rich in protein and fat, and can be used to advantage for adult animals of many classes, it is peculiarly unsuited to young stock, acting, if fed continuously or in large amounts, as if it were poisonous, and frequently proving fatal.

FEED FLOUR.

Low grade flours, known as red-dog, dark feeding flour, etc., may frequently be advantageously used in the ration, especially for young stock (calves and pigs) and for milch cows. They usually contain the germ of the wheat kernel, which is rich in oil, and are characterized by a high protein content, due to the presence of a considerable portion of those glutinous parts of the grain that formerly found a sale in "shorts" or "middlings."

Laboratory Nos. 20917 and 20918.—These samples were stated to be the product of the Maple Leaf Milling Co., Toronto, and are feed flours branded as "Ideal."

Analysis of Feed Flour.

Constituent.	No. 20197.	No. 20198.
	Per cent.	Per cent.
Moisture	6·35	6·22
Protein	21·68	21·56
Fat	2·41	4·04
Carbohydrates	62·93	62·22
Fibre	3·69	2·96
Ash	2·94	3·00
	100·00	100·00

The average composition of red dog flour, as given by an American authority, is 18·4 per cent protein, 4·0 per fat, and 3·0 per cent fibre. These samples therefore are somewhat above the average in protein content and must be considered of good quality, though one of them (No. 20197) is a little low in fat. The percentages of fibre and ash indicate freedom from refuse and dirt.

KAFFIR CORN.

This grain, though well known and of some importance in certain semi-arid regions of the southwestern United States, has not been used much in Canada. The seed is much smaller than that of Indian corn, and is generally held to be less palatable and probably less nutritious than that grain. It is slightly astringent in effect and, in consequence, is found useful for feeding with laxative forage crops, such as clover and alfalfa.

Laboratory Nos. 20332 and 20333.—These two samples labelled Kaffir corn or Korean millet from stock imported from Japan were received from the Department of Agriculture, Victoria, B.C., with a request for their analysis. They were being used in that province for poultry feeding, largely as a substitute for Indian corn.

Before preparation for analysis, these samples, between which no difference could be detected, were forwarded to the Seed Commissioner, Department of Agriculture, Ottawa, for identification, from whose office we subsequently received the following report:—

> "The two samples of seed referred to in your letter of 8th inst., belong to some variety of *Andropagon sorghum*, Brot. The cultivated forms of this plant are divided into three groups:—
>
> "(1) Those varieties whose juice has a high per cent of sugar which is used for making syrup and from which sugar is sometimes produced, known as sorghum (not cane sugar).

"(2) Those varieties cultivated for their grain known as Kaffir corn, African millet, Indian millet, durra milo maize, Jerusalem corn, Guiana corn, and Egyptian rice corn.

"(3) Those varieties cultivated for their spikes, which are used for making brooms known as broom corns.

"The seeds forwarded by you probably belong to some variety of the second group."

Our analysis of the mixed samples afforded the following data:—

Analysis—	Per Cent.
Moisture	9.01
Protein	11.37
Fat	4.95
Carbohydrates	71.78
Fibre	1.00
Ash	1.89
	100.00

Weight of 1,000 kernels, 9.942 grams.

This analysis differs somewhat from that quoted by certain textbooks for Kaffir corn, in containing less fibre and in being richer in fat.

The chief poultry instructor of British Columbia does not consider it as palatable for poultry as Indian corn, and does not advise its use as a substitute for wheat for that class of stock. He states that opinion is divided as to its value for egg production.

ELEVATOR SCREENINGS.

For the purpose of ascertaining the feeding value of elevator screenings and certain separations therefrom, a series of feeding trials was undertaken by the Division of Animal Husbandry at the Central Farm, Ottawa, the material therefor being furnished by the Seed Commissioner. The screenings were obtained from the elevators at Fort William, Ont., and the feeds therefrom were finely ground before being used.

Laboratory No. 20429.—Complete screenings, and stated to consist of:—

Scalpings, 37 per cent.
Succotash flax, 7 per cent.
Buckwheat screenings, 18 per cent.
Black seeds, 38 per cent.

Laboratory No. 20428.—Screenings without black seeds.

Laboratory No. 20427.—Black seeds.

ANALYSIS of Elevator Screenings.

Constituent.	No. 20429	No. 20428	No. 20427
	Per cent	Per cent	Per cent
Water	9·04	10·32	9·72
Protein	13·00	14·25	16·37
Oil	7·64	5·67	12·43
Carbohydrates	51·68	61·81	43·48
Fibre	13·48	5·22	12·14
Ash	5·16	2·73	5·76
	100·00	100·00	100·00

Considered simply from the standpoint of composition, as revealed by the ordinary methods of feeding stuff analysis, the complete screenings would be adjudged a feed of very fair quality, moderately rich in protein, characterized by a high fat content, the only objectionable feature being a large percentage of fibre.

The "screenings without black seeds" differ from the complete screenings in possessing a somewhat higher protein content, a smaller, though notable, percentage of oil, and very much less fibre. This material, judging from the analysis, should prove superior as a feed to complete screenings.

The black seeds, consisting essentially of the seeds of tumbling mustard, wild mustard, lambs' quarters, and other fine weed seeds, are rich in protein, very rich in oil, with a fibre content practically equal to that of the complete screenings. Unfortunately the unpleasant pungency of the oil in many of these seeds makes this material distasteful and unpalatable to stock.

The composition of the various weed and other seeds making up elevator screenings is being ascertained, and it is hoped within the next year we may be in a position to publish a more or less complete report on the possible feeding value of this by-product.

POTATO CAKE.

Laboratory Nos. 17348 and 17572.—These two samples were forwarded from Berlin, Germany, for our consideration and opinion as to their feeding value. This cake, it is stated, results as a by-product in the treatment of potatoes by a "cold press process" for the extraction of certain nitrogenous compounds that find a use in the arts. The cake is somewhat similar in appearance to linseed cake, but is lighter in colour. It was quite sound and free from mould and any objectionable smell and apparently from any taste, but the small quantity furnished did not permit of any trial with stock to ascertain its palatability or comparative feeding value.

ANALYSIS of Potato Cake.

Constituent.	No. 1.	No. 2.
	Per cent	Per cent
Moisture	11·78	7·80
Protein	3·51	3·99
Fat	·18	·25
Carbohydrates	80·29	80·21
Fibre	2·60	6·07
Ash	2·04	1·68
	100·00	100·00

This is essentially a "starch" feed, poor in protein and containing little more than traces of fat. Though possibly possessing a fair digestibility, its nutritive value would be very low. Its use would necessitate the more costly feeds, rich in protein and fat, to ensure a balanced ration. Its composition clearly shows that it cannot rank among the class of feeds known as "concentrates," bought by farmers to enrich their home-grown fodders.

MIXED CONCENTRATES AND OAT CHOP.

Laboratory Nos. 16961 and 16999.—These two feeding stuffs were forwarded for comparison by a correspondent in New Westminster, B.C., who writes: "'the mixed concentrates' is manufactured by the Grain Growers British Columbia agency at New Westminster. I understand it is made from a mixture of grain, rice meal, distillery, and brewery by-products. The price is $28 per ton. The 'oat chop' is made locally, and sells at $30 per ton."

ANALYSIS of Mixed Concentrates and Oat Chop.

Constituent.	Mixed Concentrates.	Oat chop.
	Per cent	Per cent
Moisture	7·85	5·27
Protein	14·53	11·95
Fat	9·61	3·92
Carbohydrates	54·12	64·45
Fibre	7·73	10·92
Ash	6·16	3·49
	100·00	100·00

The superiority of the mixed concentrates, though sold at a lower price, is apparent from these data; it contains higher percentages of protein and fat, and has a lower fibre content. The oat chop is free from added hulls or other refuse matter, and is a good sample of feed as prepared from the grinding of fair quality oats.

CORN AND CLOVER ENSILAGE.

Laboratory No. 16801.—This ensilage, from the Experimental Station, Cap Rouge, Que., was made by alternately cutting and filling into the silo a load of corn and a load of second-crop clover. The silo is 14 feet in diameter and 33 feet in height. The sample for analysis was taken January 15, 1914, when the ensilage had been used to a depth of 15 feet from the top. At this height in the silo, each load occupied a depth of about 5 inches. A cube of 2 feet was cut out from the centre of the silo, and the whole thoroughly mixed.

ANALYSIS of Corn and Clover Ensilage.

Constituent.	As received.	Water-free material.
	Per cent.	Per cent.
Water	74·99	
Crude protein[1]	3·38	13·52
" fat	·78	3·12
Carbohydrates	12·79	51·13
Fibre	6·22	24·87
Ash	1·84	7·36
	100·00	100·00
[1]Albuminoids	2·95	11·80
Non-albuminoids	·43	1·72
Acidity, in terms of acetic acid	·31	1·24

Our examination of this ensilage, as received, would lead one to conclude that the larger proportion was corn; the amount of clover present did not appear to be more than 25 per cent of the whole. The corn stems were slight, cobs were absent; the corn was therefore essentially leaves. The ensilage was well preserved, and had a pleasant aroma.

The analytical results indicate a higher protein content than would be expected in a mixture of equal parts of corn and clover, as will be seen by a study of the following data for corn ensilage and clover ensilage, water-free, with those for the sample under discussion:—

ANALYSIS of Corn and Clover Ensilage.

(Calculated on water-free material.)

Constituent.	Corn Ensilage.		Red Clover Ensilage.
	Decidedly Immature.	Fairly Mature.	
	Per cent	Per cent	Per cent
Crude protein	8·13	10·22	15·00
" fat	3·83	3·39	4·29
Carbohydrates	52·64	48·48	41·43
Fibre	28·72	29·91	30·00
Ash	6·70	8·00	9·28
	100·00	100·00	100·00

The ensilage in question is undoubtedly one of superior quality; from its excellent condition and its composition as revealed by chemical analysis it would assuredly prove a valuable and nutritious succulent roughage.

FROZEN SHREDDED CORN.

Laboratory No. 18688.—This sample was taken at the Experimental Farm, Indian Head, as the shredded corn was being put into the silo, August 29, 1914. The crop had been seriously injured by frost on August 9, but had been allowed to stand uncut until the 29th in the hope that some further growth might follow, but it did not recover. As viewed in the field the crop appeared very badly damaged, the greater number of leaves being dry and brittle. It showed no cobs. The variety was North Western Dent and was sown May 24. There had been no rain between the 9th and 24th August, with fairly high temperature.

Analysis—	Per Cent.
Water	83.80
Crude protein	2.80
" fat	·18
Carbohydrates	7·21
Fibre	4.34
Ash	1·67
	100.00

The large percentage of water indicates the immaturity of the corn and, of necessity, lowers the feeding value of the ensilage. The water content of corn when generally recognized to be in the best condition for the silo—the ears glazing and the lower leaves turning yellow—is between 70 and 75 per cent. Such a corn would contain, say, 25 per cent dry matter, as against 16·2 per cent in the present immature, frozen sample.

Frozen corn may make very good ensilage and, if the corn has been fairly mature, the product will not have suffered in quality. Such ensilage has been found to be relished by cattle, and does not appear to be in any way injurious to them. It would seem, therefore, desirable as the season draws to a close to leave a crop of immature corn for one or even two weeks and run the risk of it being frozen, for, if the frost does

not occur, the corn will probably increase in value by the gain of 5 to 10 per cent of dry matter.

As a rule it is advisable to get the corn into the silo as soon as possible after it has been frozen, as heavy rains would materially lower the feeding value of the now dead leaves.

OAT FODDER CURED GREEN AND AS ENSILAGE.

Laboratory Nos. 19779 and 20070.—These samples of ensilage from green oats and of cured green feed were forwarded from the Experimental Station at Lacombe, Alta., where they were used in a comparative feeding experiment with steers. The Superintendent at Lacombe writes: "This ensilage from green oats is much relished by the cattle, and we are conducting experiments to ascertain its food value as compared with that of fodders available here. The cured green feed is originally the same as that put in the silo, but it has been cured in the shock and stacked."

Analysis of Oat Fodder and Oat Ensilage.

Constituent.	Oat Fodder.		Oat Ensilage.	
	As received.	Dry matter	As received	Dry matter
	Per cent	Per cent	Per cent	Per cent
Water	12·91	....	60·40	
Crude protein	8·63	9·91	4·85	12·25
" fat	1·70	1·95	1·10	2·78
Carbohydrates	45·67	52·44	16·22	40·96
Fibre	24·33	27·93	14·18	35·81
Ash	6·76	7·77	3·25	8·20
	100·00	100·00	100·00	100·00

Comparing the oat fodder with the ensilage, both as received, weight for weight, 100 pounds of the former should have a feeding value, approximately, of 250 to 300 pounds of the latter. This deduction is made simply from the analytical data, and does not take into consideration the relative digestibility of the two fodders nor the value to be attached to the quality of succulency of the ensilage. We have no data as to the digestion coefficients of these materials, but it seems probable that there would not be any great differences between the fodder and the ensilage in these particulars. Succulency is a quality or property that it is difficult to value in exact terms in considering a fodder from the standpoint of its chemical composition, but we know that it frequently has a distinct value in the ration, especially in that of the dairy cow.

A study of the composition of the dry matter of the two feeds would indicate that the fermentative action in the silo has more particularly led to the destruction of a part of the carbohydrates, thereby increasing the relative proportions of crude protein and fibre. This is in accord with the action of ensiling on Indian corn. Probably the crude protein in the ensilage has not the same value as that of fodder, weight for weight, as in the processes of fermentation a portion of the true albuminoids is broken down into the less valuable form, from the nutritive standpoint, of amides and allied compounds.

UPLAND PRAIRIE HAY AND TIMOTHY HAY.

Laboratory Nos. 20444-5-6.—These fodders were forwarded from the Experimental Station at Lacombe, Alta., where they were used in feeding trials with steers during the winter 1914-15. Prairie hay No. 1 is stated to have been cured under more favour-

able weather conditions than No. 2. They are both considered to be representatives of fair quality prairie hay.

The notes taken on the hays as received are as follows: Timothy hay, rather dry and harsh, probably a little overripe when cut, rather short heads, clean, and with good aroma. Prairie hay No. 2, of fine quality, very few heads, of good green clour and pleasant aroma—in first-class condition. Prairie hay No. 2 consists of the same grasses as No. 1, a few heads only, slightly yellow and discoloured.

ANALYSIS of Upland Prairie and Timothy Hay.

Constituent.	Upland Prairie Hay.		Timothy Hay.
	No. 1.	No. 2.	
	Per cent	Per cent	Per cent
Water	4·52	4·76	4·56
Crude protein	7·53	7·50	5·58
" fat	3·14	3·39	3·59
Carbohydrates	45·33	47·87	44·58
Fibre	32·35	29·80	36·33
Ash	7·13	6·68	5·36
	100·00	100·00	100·00

The two samples of prairie hay are practically identical in composition, the only notable difference in composition being the slightly higher fibre content in No. 1.

Judging simply from the analyses, we should conclude that the prairie hay possessed a somewhat higher feeding value than the timothy, for the latter contains 2·0 per cent less crude protein, and a larger proportion of fibre.

OAT STRAW.

Laboratory No. 20545.—This was grown at the Experimental Station, Lacombe, Alta., in 1914, and used in feeding trials with steers. It was considered of interest to ascertain the composition of the straw cured under the climatic conditions of the West as compared with that of straw cured in Eastern Canada.

ANALYSIS of Oat Straw.

Constituent.	No. 20545	Average of many Analyses of Eastern oat straw.
	Per cent.	Per cent.
Water	4·39	9·2
Crude protein	5·99	4·0
" fat	1·78	2·3
Carbohydrates	44·66	42·4
Fibre	36·22	37·0
Ash	6·86	5·1
	100·00	100·00

It must be pointed out that the composition of straw depends in a large measure on the stage of growth at which the crop is cut—the greener the straw the more nutritious the fodder. This fact precludes the possibility of making any hard and fast conclusions from analyses as to the effect of climatic conditions on curing, unless the stage of growth at the time of cutting is the same for the straws compared. We are only safe in stating from the present work that this sample of western-cured oat straw has a somewhat higher protein content than that of oat straw in the East.

Miscellaneous.

CANNED SEA-URCHIN.

Laboratory No. 19752.—This product was put up in British Columbia by Mr. A. Ikeda, a Japanese engaged in extensive business operations in fishing and mining along the northern coast of that province. The analysis was made at the request of the Provincial Secretary of British Columbia, submitted through the Department of the Naval Service, Ottawa.

In forwarding the sample, which consisted of three, approximately 1-pound, tins, Mr. Ikeda writes as follows:

> "The sample being sent you is canned sea-urchin, gathered by myself this year in northern British Columbia waters. This article, I understand, has been used by the native Indians of this province as food. It is also similarly used by the people on the Mediterranean Sea, and our Japanese public have been eating them for centuries.
>
> "My desire is to introduce it to the general public of North America as a food, but before doing so wish to obtain a report as to its nutritive value from a governmental department at Ottawa."

The cans, as received, were in good order, and the contents quite sound.

The material is a thick orange-red paste, consisting of a mass of small eggs with a very little free fluid. It has a characteristic and rather strong odour, not altogether unlike that of anchovy.

All three cans were opened and the contents found to be similar as to condition and appearance. Material from two of the cans was separately analysed and the data obtained were practically identical, establishing the homogeneity of the product.

Analysis—	Per cent
Water	66·64
Albuminoids	12·01
Fat or oil	12·88
Ash	1·09

For the purposes of comparison we append the analyses of certain shell-fish.

Analysis of Shell-fish.

—	Water.	Albuminoids.	Fat.	Ash.
	Per cent	Per cent	Per cent	Per cent
Crab, edible portion	77·1	16·6	2·0	3·1
Cray-fish, edible portion	81·2	16·0	·5	1·3
Lobster, edible portion	79·2	16·4	1·8	2·2

That this canned sea-urchin possesses a very considerable food value, our analysis distinctly shows. Though containing somewhat less protein than lobsters and crabs, it is distinctly richer in fat. Of what practical importance the sea-urchin might

become as an article of food, it is difficult to say; no doubt the taste is one that would have to be acquired, and the probability is that though the product is rich and piquant, its introduction would be very slow.

THE RELATIVE VALUE OF FIELD ROOTS.

In past reports of this Division we have emphasized the importance, from the nutritive as well as from the medicinal standpoint, of field roots in the ration of farm stock. They are palatable, appetizing and highly digestible; they have an appreciable feeding value, chiefly from the sugar they contain, and they are also useful in maintaining the health and thrift of the animal, due largely to their potash compounds.

This investigation, continued since 1904, has had for its object the determination of the relative feeding qualities of the more common field roots, a matter to which farmers have hitherto paid little attention. In roots the " dry matter," upon which this feeding value, as in all fodders, depends, is made up chiefly of sugar, starch, pectin, and other carbohydrates. Roots are not highly nitrogenous, and their percentage of fibre is usually low, the latter no doubt a factor of significance in aiding their digestion by the animal. It is evident from these considerations that the percentages of dry matter and sugar mark or measure their feeding properties—the larger the percentages the greater the value of the root.

All the varieties analysed and reported on in this work have been grown on the Central Experimental Farm, Ottawa.

MANGELS.

Twenty-four varieties have been submitted to analysis. Many of these have been examined in past years, but a number are now for the first time reported on. In the table that follows, the mangels are arranged in the order of their dry matter content. It will be seen that in a general way, but not invariably, the sugar content follows the dry matter. The size of the roots analysed is indicated by the " average weight of one root " recorded in the last column of the table.

Table I.—Analysis of Mangels, Central Experimental Farm, Ottawa, Ont., 1914.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of one Root.	
	p.c.	p.c.	p.c.	lb.	oz.
Giant Half Sugar White	82·80	17·20	9·26	2	2
Mammoth Long Red	85·32	14·68	6·47	1	14
Danish Sludstrup	85·58	14·42	8·40	1	11
Gate Post	85·60	14·40	8·0	2	11
Improved Mammoth Saw Log	85·96	14·04	8·39	2	0
Weibull's Ljusrod	85·96	14·04	8·69	1	2
Taaroji Barres	86·30	13·70	9·01	1	15
Prize Long Red	86·40	13·60	8·42	1	12
Weibull's Barres Rodgul	86·52	13·48	9·99	2	4
Giant Yellow Intermediate	86·96	13·04	7·80	2	0
Golden Tankard	87·46	12·54	7·01	1	14
Perfection Long Red	87·48	12·52	8·01	1	2
Mammoth Yellow Intermediate	87·56	12·44	7·00	2	3
Weibull's Cylinder Barres	87·56	12·44	7·97	2	4
Elvetham Mammoth	87·70	12·30	8·20	2	2
Weibull's Eckendorffer Red	87·94	12·06	6·53	2	8
Sludstrup Barres	87·94	12·06	5·76	2	8
Selected Yellow Globe	88·32	11·68	7·34	1	15
Yellow Leviathan	88·48	11·52	6·71	2	2
Giant Yellow Globe	88·84	11·16	6·32	2	1
Danish Eckendorffer Yellow	89·00	11·00	6·80	2	0
" Red	89·00	11·00	6·63	2	3
Weibull's Eckendorffer Gul	89·02	10·98	11·59	2	0
Weibull's Excelsior Rod	90·38	9·62	4·65	2	15

Although differences of note in dry matter, and hence in feeding value, are to be observed, the mangels of last season (1914) as grown on the Central Farm do not exhibit the wide "spread" in this regard that has been noticed in previous years of this investigation. The Giant Half Sugar White stands out by itself as decidedly superior to the rest of the series. The remainder, as regards dry matter, practically lie between 11·0 per cent and 14·5 per cent. Previous records have generally shown a number of varieties containing between 7 per cent and 11 per cent dry matter, and hence inferior to the goods now reported upon. The comparatively high and uniform results from the mangels of 1914 are probably due in part to the introduction of improved varieties not hitherto grown here, but the writer is of the opinion that it also in a large part is due to the favourable seasonal conditions for the root crop that prevailed during the latter summer months of last year. These conditions were conducive to the development of sugar—the chief element of feeding value in roots.

In the following table we present certain averages as obtained from this investigation since its inception in 1904. It will be observed that the results for 1914, both as regards dry matter and sugar, are higher than those of any preceding years.

TABLE II.—Mangels—Yield and Average Composition, 1904-1914.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Yield per Acre.		Dry Matter.	Sugar.
		Lb.	Oz.	Tons.	Lb.	p.c.	p.c.
1904	10	2	11	30	1,277	11·69	6·62
1905	17	3	9	39	369	10·04	4·67
1906	16	2	7	31	159	11·63	5·93
1907	10	2	11	27	680	12·64	7·46
1908	12	2	2	23	6 0	11·87	5·33
1909	14	3	5	28	920	11·21	6·21
1910	8	5	10	56	57	10·04	4·46
1912	23	2	9	29	61	9·51	6·43
1913	13	2	14	.....	.....	10·51	5·63
1914	24	2	1	23	50	12·79	7·75
Average for 10 years	.....	3	0	32	29	11·19	6·05

INFLUENCE OF HEREDITY IN MANGELS.

While the character of the season has much to do with the relative richness of roots, there can be little doubt but that heredity plays an important part in this direction. To obtain data on this interesting point, namely, that a certain character as to composition may be transmitted, two well-known varieties of mangels—the Gate Post and the Giant Yellow Globe—were selected in 1900. These have been grown side by side yearly since that date under the same soil and seasonal conditions, and the comparison of the results as to dry matter and sugar makes a very interesting and instructive study.

TABLE III.—Dry Matter and Sugar in Gate Post and Giant Yellow Globe Mangels.

Season of Growth.	Gate Post				Giant Yellow Globe			
	Average Weight of One Root.		Dry Matter.	Sugar in Juice.	Average Weight of One Root.		Dry Matter.	Sugar in Juice.
	Lb.	Oz.	p.c.	p.c.	Lb.	Oz.	p.c.	p.c.
1900	....		11·14	6·15	....		8·19	2·64
1901	2	9	9·41	4·15	3	3	9·10	4·08
1902	3	2	13·90	9·39	3	9	10·24	5·24
1903	3	3	12·93	7·38	3	13	10·89	6·17
1904	2	14	12·64	7·62	2	13	9·24	5·26
1905	2	13	12·07	6·83	3	12	8·64	3·55
1906	2	2	12·90	6·59	1	8	12·73	6·45
1907	3	10	12·53	7·25	2	7	10·78	6·34
1908	1	11	12·02	4·94	2	4	10·66	4·47
1909	3	14	11·82	6·64	3	7	10·95	5·82
1910	6	8	9·59	4·26	6	13	7·80	2·74
1911	2	11	10·04	3·86	3	1	6·66	1·85
1912	3	5	8·98	5·05	3	2	7·87	4·75
1913	3	5	10·98	6·27	2	15	8·90	5·18
1914	2	11	14·40	8·00	2	1	11·16	6·32
Average for 15 years..	....		11·68	6·29	....		9·58	4·72

Thus, it will be seen, for fifteen years, without a single exception, the Gate Post has proved superior to the Giant Yellow Globe, both in dry matter and sugar, a fact which indicates that quality may be transmitted and, incidentally, that improvement in farm roots is possible by skilful work in selection and breeding.

TURNIPS.

Thirty varieties of turnip were analysed. A large number of the varieties now reported on were grown at the Central Farm for the first time in 1914. The series, however, includes certain turnips that have been examined for many years in this investigation.

TABLE IV.—Analysis of Turnips, Central Experimental Farm, Ottawa, Ont., 1914.

Variety	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p.c.	p.c.	p.c.	Lb.	Oz.
New Century	89·00	11·00	·7	3	2
Hall's Westbury	89·00	11·00	·6	3	0
Haszard's Improved	89·20	10·8	·7	2	9
Canadian Gem	89·20	10·8	1·2	3	2
MagnumBonum	89·20	10·8	·7	3	0
Corning's Lapland	89·30	10·7	·7	2	15
Bangholm Selected	89·34	10·66	·6	2	0
Kangaroo	89·64	10·36	·7	2	6
Hartley's Bronze Top	89·80	10·20	·5	2	8
Weibull's Ostersunden	89·80	10·2	1·0	2	0
Oslgaard Bangholm Short-neck	89·80	10·18	·8	1	9
Halewood's Bronze Top	89·86	10·14	·5	2	10
Good Luck	89·90	10·1	·7	3	0
Shepherd's Golden Globe	90·00	10·0	·6	2	1
Paijirg Bangholm	90·00	10·0	·8	1	12
Mammoth Clyde	90·06	9·94	·4	2	3
Jumbo	90·10	9·9	·64	3	0
Empress	90·10	9·9	·5	3	1
Durham	90·10	9·9	·4	3	0
Weibull's Bangholm	90·40	9·6	1·1	2	2
Skirvings	90·62	9·38	·5	2	3
Perfection	90·80	9·2	·72	2	2
Best of All	91·00	9·0	·61	2	15
Greystone	91·50	8·5	·8	1	0
Weibull's Svensk Slat	91·60	8·4	·90	1	15
Danish Yellow Tankard	91·70	8·3	1·0	1	8
Dali's Hybrid	91·80	8·2	1·0	1	15
Fjusk Bortfielder	91·80	8·2	1·21	1	9
Weibull's Pedigree Bortfielder	92·20	7·8	1·24	2	12
Weibull's Sekel	92·60	7·4	1·10	2	0

The data show that between the best and the poorest in the series there is a difference of 3·6 per cent dry matter. Assuming that the feeding value is measured by the dry matter, this indicates that of the former 2,000 pounds are equivalent to 2,972 pounds of the latter—a matter of no small significance. Yield and keeping qualities are certainly questions to be considered in the selection of the varieties to grow, but our results with turnips, as with mangels, emphasize the desirability of paying some regard to the matter of composition.

Though in many instances the turnips closely approach or equal mangels in dry-matter content, they are decidedly inferior as a class to mangels as regards sugar.

Averages for yield and composition for the past nine years are given in the following table:—

TABLE V.—Turnips, Yield and Average Composition, 1905-1914.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Yield Per Acre.		Dry Matter.	Sugar.
		Lb.	Oz.	Tons.	Lb.	p.c.	p.c.
1905	20	2	13	30	1,060	10·09	1·10
1906	20	1	10	15	1,890	12·18	1·78
1907	14	3	5	33	142	10·14	1·11
1908	13	3	12	27	1,033	9·87	1·52
1909	13	2	10	29	542	11·30	1·43
1910	10	3	11	31	565	10·87	1·07
1912	19	3	12	33	155	8·65	1·10
1913	19	2	14	24	1,271	9·58	1·54
1914	30	2	0	22	130	9·68	·76
Average for 9 years						10·27	1·27

The average percentage of dry matter for the past season (9·68 per cent) is almost identical with that of 1913, but the sugar content is lower—0·76 per cent as compared with 1·54 per cent. In this latter particular the turnips of 1914 differ markedly from those of all previous years, the figures showing that for eight seasons the average sugar content is fairly constant at about 1¼ per cent.

CARROTS.

This series includes eight varieties, the larger number of which have already been examined in past seasons. White Belgian and Champion, as in 1913, are recorded as amongst those with the highest percentage of dry matter and sugar. The variety "James" analysed for the first time, appears particularly rich in sugar. The difference in dry matter between the best and the poorest of those examined is 2·0 per cent, or stated otherwise, 2,000 pounds of the former would have a feeding value equivalent to 2,370 pounds of the latter.

Though not differing markedly from turnips in their percentage of dry matter, carrots are decidedly richer in sugar.

TABLE VI.—Analysis of Carrots, Central Experimental Farm, Ottawa, Ont., 1914.

Variety.	Water	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p.c.	p.c.	p.c.	Lb.	Oz.
Champion	87·20	12·80	3·02	0	12
White Belgian	87·80	12·20	2·02	0	10
James	88·40	11·60	4·09	0	8
Ontario Champion	88·70	11·30	2·00	0	10½
Mammoth White Intermediate	89·10	10·90	1·75	0	10
Giant White Vosges	89·10	10·90	2·57	0	12
Nantes	89·10	10·90	3·48	0	6
Improved Short White	89·20	10·80	2·03	0	10

The yield and average composition of the carrots examined during the past nine seasons are given in the following tabular scheme:—

TABLE VII.—Carrots—Yield and Average Composition, 1905-1914.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Yield Per Acre.		Dry Matter.	Sugar.
		Lb.	Oz.	Tons.	Lb.	p.c.	p.c.
1905	11	1	3	25	1,510	10·25	2·52
1906	10	1	2	19	1,605	10·59	3·36
1907	6	1	1	24	1,517	10·30	3·02
1908	6	1	3	22	133	10·89	3·34
1909	6	1	0	17	1,680	10·40	2·30
1910	5	1	9	13	1,640	10·17	3·23
1912	6	1	1	18	545	10·50	2·54
1913	6	1	8	24	1,100	9·11	2·11
1914	8	0	10	21	1,359	11·42	2·62
Average for 9 years						10·40	2·78

The carrots of 1914 were somewhat above the average in dry matter, with a sugar content almost identical with the average for the nine years of the investigation.

SUGAR BEETS FOR FACTORY PURPOSES.

For a number of years we have been obtaining data as to the quality of sugar beets as grown in various parts of the Dominion. As heretofore, four leading varieties have been sown on the Experimental Farms and Stations, fifteen in all, and representative samples of the harvested beets forwarded for analysis to the Chemical Laboratories at Ottawa, where the sugar-content and coefficient of purity were determined.

The seed of the varieties employed, Vilmorin's Improved A, Vilmorin's Improved B, French Very Rich, and Klein Wanzleben was obtained from the firms of Vilmorin, Andrieux et Cie., Paris, France, who have long made a specialty of the breeding of high-quality beets. As the seed distributed was all from the same stock, the results indicate variations in richness, etc., due to climatic, soil, and probably cultural conditions, prevailing in the several localities.

The localities at which this experiment has been carried on are as follows: Charlottetown, P.E.I.; Kentville and Nappan, N.S.; Fredericton, N.B.; Cap Rouge, Que.; Ottawa, Ont.; Brandon, Man.; Rosthern, Scott, and Indian Head, Sask.; Lethbridge, Alta.; Agassiz, Sidney, and Invermere, B.C.; the seed failed to germinate at Lacombe, Alta.

The results of the analysis, with certain other data of interest, are recorded in the following table. In the larger number of instances the beets were found to be eminently satisfactory, both as to richness and quality; it was at a few points only that the roots were below the standard required for factory purposes.

SUGAR BEETS grown on the Dominion Experimental Farms, 1914.

Variety.	Locality.	Percentage of Sugar in juice.	Percentage of Solids in juice.	Co-efficient of Purity.	Average Weight of one Root.		Yield per acre.	
		Per cent.	Per cent.	Per cent.	Lb.	Oz.	Tons.	Lb.
Vilmorin's Improved A........	Charlottetown, P.E.I.........	18·0	20·1	89·5	2	4	15	1,000
	Kentville, N.S..............	16·90	19·25	87·8	–	14	16	736
	Nappan, N.S.................	17·74	20·5	86·8	–	14	8	200
	Fredericton, N.B............	15·90	18·8	84·53	–	15	10	1,585
	Cap Rouge, P.Q..............	14·27	17·25	84·67	–	1	5	600
	Ottawa, Ont.................	19·89	23·0	86·50	1	4	14	400
	Brandon, Man................	11·28	18·25	59·3	2	4	19	1,294
	Rosthern, Sask..............	12·90	16·33	79·0	2	5	7	92
	Scott, Sask.................	15·03	17·29	86·94	–	12	9	
	Indian Head, Sask...........	16·96	20·4	83·2	1	8	11	700
	Lethbridge, Alta. (Irrig.)....	13·90	16·5	84·2	1	12	7	1,250
	" " (Non-irrig.)	14·88	18·0	82·6	1	10	9	
	Agassiz, B.C................	14·78	17·2	84·9	2	1	12	200
	Sidney, B.C.................	14·9	16·26	91·4	3	3	4	900
	Invermere, B.C..............	19·11	20·8	91·85	–	10	7	850
Vilmorin's Improved B........	Charlottetown, P.E.I.........	18·61	19·6	94·7	2	0	12	1,500
	Kentville, N.S..............	17·30	20·03	86·4	–	14	14	248
	Nappan, N.S.................	18·25	20·4	89·5	–	12	8	300
	Fredericton, N.B............	16·79	18·8	89·2	1	4	12	200
	Cap Rouge, P.Q..............	15·23	17·3	90·18	1	1	5	500
	Ottawa, Ont.................	20·07	23·1	86·90	1	1	13	800
	Brandon, Man................	11·10	19·0	58·40	2	2	22	1,424
	Rosthern, Sask..............	12·42	16·49	75·34	2	8	7	1,277
	Scott, Sask.................	15·55	18·47	84·20	–	9	8	1,000
	Indian Head, Sask...........	16·77	20·2	83·97	1	10	11	550
	Lethbridge, Alta. (Irrig.)....	11·60	17·8	65·2	1	4	6	600
	" " (Non-irrig.)	14·13	18·35	77·0	1	6	9	1,250
	Agassiz, B.C................	16·48	20·39	80·85	2	1	9	1,900
	Sidney, B.C.................	15·5	17·31	89·5	1	10	6	400
	Invermere, B.C..............	19·95	22·0	90·6	–	12	7	476
Klein Wanzleben...	Charlottetown, P.E.I.........	18·09	20·2	89·6	2	6	14	1,500
	Kentville, N.S..............	17·25	20·33	84·8	1	1	15	1,904
	Nappan, N.S.................	18·62	20·76	89·7	–	9	8	650
	Cap Rouge, P.Q..............	14·18	17·0	85·31	1	2	5	200
	Ottawa, Ont.................	20·95	24·1	25·17	1	2	13	1,150
	Brandon, Man................	11·23	20·0	36·14	2	4	20	1,072
	Rosthern, Sask..............	12·76	15·63	81·66	2	6	4	1,773
	Scott, Sask.................	14·97	17·83	84·00	–	10	8	1,000
	Indian Head, Sask...........	16·48	19·7	83·75	1	5	10	350
	Lethbridge, Alta. (Irrig.)....	13·46	16·2	83·0	1	8	7	50
	" " (Non-irrig.)	14·37	17·4	82·6	1	7	9	1,750
	Agassiz, B.C................	14·78	17·5	84·4	2	12	12	1,700
	Invermere, B.C..............	18·51	21·4	86·5	–	12	8	1,061
French Very Rich..	Charlottetown, P.E.I.........	17·06	19·1	89·3	2	4	13	1,500
	Kentville, N.S..............	16·85	19·23	87·5	1	–	16	1,704
	Nappan, N.S.................	16·58	20·63	80·35	–	10	9	50
	Fredericton, N.B............	15·24	18·0	84·7	1	2	10	500
	Cap Rouge, P.Q..............	13·72	16·56	84·53	1	1	2	1,500
	Ottawa, Ont.................	18·46	21·2	85·86	1	7	14	200
	Brandon, Man................	14·63	16·5	88·66	2	12	16	912
	Rosthern, Sask..............	11·70	14·43	81·10	2	7	8	179
	Scott, Sask.................	13·14	15·63	84·04	–	9	8	750
	Indian Head, Sask...........	15·97	18·7	85·4	1	5	12	200
	Lethbridge, Alta. (Irrig.)....	12·85	16·5	77·9	1	10	6	1,000
	" " (Non-irrig.)	13·55	16·2	83·6	1	6	8	1,200
	Agassiz, B.C................	14·23	16·5	86·24	2	2	14	1,900
	Invermere, B.C..............	18·58	20·6	89·2	1	-	8	1,226
Raymond Seed....	Lethbridge, Alta. (Irrig.)....	13·00	15·6	83·0	1	1	......	
	" " (Non-irrig.	13·77	16·7	82·5	1	2	..	

From information supplied by the Superintendents, the following notes respecting the soil and season at the several Farms and Stations have been compiled:—

Charlottetown, P.E.I.—The soil is a sandy loam, in very good condition. The season generally was very favourable to the growing of roots, and the warm, sunshiny weather during the weeks in which they matured would materially assist in the development of sugar.

The results give evidence of a large crop of excellent quality, the percentage of sugar is very high in all three varieties, the average being 17·94 per cent, while the coefficient of purity is also most satisfactory.

Kentville, N.S.—The soil was a sandy loam of fair quality and the season for root crops must be considered throughout as good.

The yields per acre were very good, and the analytical results indicate a crop of superior quality. The first year of trial at this Station was 1913, when an average for sugar in juice of 17·17 per cent was obtained: the average for 1914 is practically identical, namely, 17·07 per cent.

Nappan, N.S.—The soil was a clay loam, underlaid by a subsoil of sand. Weather conditions were unfavourable till the middle of June. June and July were good growing months. Unsettled weather, dull, wet, and cold, commenced about the middle of September; hence conditions were not very favourable during the ripening period of the beets.

The sugar percentage in three of the four varieties is very high, though the average does not quite equal that of 1913. The beets grown at this Farm have almost invariably been characterized by an excellent sugar content. In the thirteen years of the investigation the average percentage of sugar has only three times fallen below 16·0 per cent.

Fredericton, N.B.—The soil is a moderately light sandy loam, in fairly good condition. The weather was cold and backward until August 1. From that until the roots were taken up (October 31) it was extremely favourable. The Superintendent reports the crop as poor.

The results generally show a root of good quality, the average sugar content for the three varieties grown being 15·98 per cent.

Cap Rouge, Que.—The soil is a sandy loam with a shaly subsoil at from 15 to 24 inches. The spring was rather early, with sufficient rain to start germination. The early part of June was somewhat dry, but there were good rains on the 25th, 29th and 30th of that month. A drought which lasted all through July until August 11 cut down the yield. Conditions subsequent to the latter date were good for the root crop.

It will be observed that the yields are exceedingly low.

As pointed out in our report of 1913, the sugar beet crop and, indeed, all roots on this Station for the previous three years had been a failure. An examination of the soil showed that it was sour and deficient in lime. To ascertain if therein lay the cause of the failure, lime was applied at the rate of 2 tons per acre between the 12th and 17th of May, 1914, and harrowed in, the land having been ploughed in the autumn of 1913. The root crops on the unlimed plots, left as a check, were a complete failure—not worth harvesting. The yield on the limed plots, though small, was much larger than those previously obtained, indicating that the liming had had a beneficial effect on the growth of roots on this soil. The experience with sugar beets was that with all the other classes of roots.

The sugar content was only fair, probably in a measure due to the unfavourable weather conditions already noted.

Ottawa, Ont.—The soil is a light, sandy one, in good condition, there being an ample supply of humus present.

The rainfall during the growing season was light, but the yield was fair. The beets were of excellent quality, a higher average for sugar content being obtained than for any previous season since the investigation began in 1902.

Brandon, Man.—The soil is a rich, black clay loam, with a high nitrogen content. The season throughout was considered as "decidedly dry."

The yield was very large, which is usually the case at this Farm.

The results as regards sugar content are much below the average, and the coefficient of purity is very low. As remarked in our report for 1913, occasionally beets with a satisfactory sugar content are obtained at this Farm, but, as a rule, the data do not indicate high quality either as regards sugar or purity.

Rosthern, Sask.—The surface soil is described as black, moderately heavy loam 6 inches in depth, underlaid by clay loam to the depth of 10 inches, then sand. It was summer-fallowed in 1913.

The first sowing did not germinate regularly owing to drought, and the "stand" was poor. A second sowing was made a month later. The yields on the several plots were irregular and, as a rule, light.

The data do not indicate a satisfactory beet for factory purposes, either as to sugar content or purity.

Scott, Sask.—The soil is a dark chocolate, moderately heavy loam; it was broken from prairie in 1913 and thoroughly worked.

The season was hot and dry, with insufficient rainfall. From April 1 to August 30 the precipitation was 8·09 inches. This fell in numerous light showers which seldom penetrated to the root zone of the beets. The roots, in consequence, were very small, and the yield per acre light.

The sugar content was rather low, and the indications generally for the production of a crop suitable for factory purposes are not favourable.

Indian Head, Sask.—The soil is a rich clay loam; it had been summer-fallowed in 1913, but was not manured.

After the seed had been sown there were no rains until a light shower on June 18, and the season generally was hot and dry, especially July, August, and September. As a result there was little growth till October, when the crop made a fair growth. The yield was only fair.

The average percentage of sugar, while much lower than that of 1913, is in fair accord with the average of previous years.

Lethbridge, Alta.—The soil is described as a "chocolate loam." The season was extremely dry during April, May, and most of June. This resulted in a very poor and irregular germination and a very poor "stand." The seed on the "irrigated" plot did not germinate till water was applied, May 29. A second irrigation was made July 29. There was plenty of rain in August and September, which brought the crop along and much benefited the yields. The Superintendent considers that owing to the irregular "stand," results, both as to quality and yield, are abnormal.

The sugar content of the beets on the non-irrigated land was, in all four varieties, higher than that of the beets grown with irrigation, but for both irrigated and non-irrigated it is below the average. The coefficients of purity are also decidedly low. In previous years, with one or two exceptions, this Station had produced beets, both on irrigated and non-irrigated land, of excellent quality for factory purposes. Presumably the wet weather of August and September prevented the beets from properly ripening.

Sugar-beet seed obtained from the sugar factory at Raymond, Alta., was also sown on irrigated and non-irrigated land. The results, generally, show a somewhat superior

root to those obtained from our own imported seed; as with the Vilmorin beet, the non-irrigated crop had a slightly higher sugar content.

Lacombe, Alta.—The seed failed to germinate owing to the extreme dryness of the soil, and in consequence there are no data to put on record.

Agassiz, B.C.—This is a rather poor sandy loam. It received 20 tons of half-rotted manure, 250 pounds of superphosphate, 150 pounds of muriate of potash, and 100 pounds of nitrate of soda per acre.

The early part of the season was unusually dry, but after September 7 it was very wet. The roots were taken up November 14.

The yield was light, not much more than half the crop usually obtained at this Farm.

The sugar content in all varieties was low, though indicating a beet that could be profitably used for sugar production. For a number of years previous to 1914, the quality of the sugar beets raised here had been of a very high order. The unfavourable data now recorded appear to be largely due to the exceptionally wet autumn, which naturally prevented the normal ripening of the roots and the proper development of sugar.

Sidney, B.C.—The soil is described as a black loam, underlaid with clay.

During June, July, and August it was very dry. In September the precipitation was 1·97 inches and from October 1 to 20, the latter the date of harvesting the crop, it was 3·38 inches.

The yield was very low. Two varieties only, Vilmorin's Improved A and B, were grown. They showed a fair percentage of sugar, with a high coefficient of purity.

Invermere, B.C.—The soil is described as a sandy, alluvial loam, deficient in humus. It was dressed in the spring with manure at the rate of 12 tons per acre, and 100 pounds of nitrate of soda after singling the roots.

The early part of the season was favourable for plant growth. During the latter summer months it was exceptionally hot and dry, necessitating an extra irrigation.

The yields were low, but the percentage of sugar and the coefficient of purity in every instance were very high and extremely satisfactory.

The following table will allow a comparison of the averages as regards sugar content obtained in this investigation since 1902:—

AVERAGE Percentage of Sugar in Juice in Sugar Beets grown on the Dominion Experimental Farms, 1902-14.

Locality.	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914
Charlottetown, P.E.I.									14·25	17·23	15·31	15·63	17·94
Kentville, N.S.												17·17	17·07
Nappan, N.S.	15·87	15·33	14·41	16·52	17·08		17·53	16·74	16·43	17·56	16·68	19·17	17·79
Fredericton, N.B.													15·98
Cap Rouge, P.Q.										16·16	14·92	19·94	14·38
Ottawa, Ont.	16·77	15·34	16·91	12·45	14·37	15·44	16·30	14·84	16·44		17·59	16·48	19·84
Brandon, Man.		11·36	16·62	11·09	15·50	16·99	15·82	18·83	18·40	13·50	13·40	13·92	12·06
Rosthern, Sask.										13·30	14·63	15·61	12·69
Scott, Sask.													14·67
Indian Head, S'k	15·15	16·54	15·24	14·94	14·91	15·92	15·66	17·10		14·48	15·78	20·73	16·54
Lethbridge, Alta. (Irrig.)							16·09	17·91		17·02	17·41	19·54	12·95
Lethbridge, Alta. (Non-irrig.)							16·73	18·36		14·05	17·68	19·33	14·23
Lacombe, Alta.						13·34	11·21	12·77	12·69			12·67	
Agassiz, B.C.		17·44	8·10	17·32	14·28	17·65	17·15	18·30	19·18	16·95	17·53	18·08	15·07
Sidney, B.C.													15·2
Invermere, B.C.													19·04

Beets were grown last year for the first time at the Stations at Fredericton, N.B., Scott, Sask., and Sidney and Invermere, B.C.

In the larger number of instances the results are quite satisfactory, indicating that beets suitable for sugar extraction may be grown at widely distant points in the Dominion. The average sugar content of the beets from two of the sixteen localities was over 19 per cent; at three, between 17 and 18 per cent; at four, between 15 and 17 per cent; at five, between 14 and 15 per cent; and at four, between 12 and 14 per cent.

THE FERTILIZING VALUE OF RAIN AND SNOW.

The chief object of this investigation, from an agricultural standpoint, is to determine the amount and character of the soluble nitrogen compounds in the rain and snow which, it may be supposed, serve to enrich the soil. Nitrogen is the dominant element of plant food, that is, crop growth is largely measured by the available nitrogenous food in the soil. The growth of crops removes nitrogen, and there is also a certain loss of soil nitrogen by bacterial activity, drainage, and other processes consequent upon tillage. Hence this research should afford data of interest and value in our study of the very important and vital problem of the up-keep of soil nitrogen. It may be added that this work, carried on at Ottawa, constitutes a Canadian contribution towards an inquiry into the fertilizing value of rain and snow which is receiving attention in other parts of the world. This fact enhances the value of our data.

This examination of rain and snow was commenced in 1907, and past reports of this Division record the results obtained during the first seven years of the investigation. The data for the eighth year closing February 28, 1915, are now recorded and discussed.

The year March, 1914, to February, 1915, inclusive, was, at Ottawa, particularly dry. The total precipitation (rain and snow) was only 25·34 inches, whereas for the previous twenty-three years the average was 34·34 inches, and this fact has very materially reduced the amount of nitrogen hitherto recorded as annually supplied to the soil by rain and snow.

During the twelve months, sixty-eight samples were analysed, forty-four of rain and twenty-four of snow, together representing the total precipitation of 25·34 inches.

In table I particulars are given of the monthly totals of precipitation and data for the monthly average nitrogen-content of the precipitation, present as free and albuminoid ammonia and as nitrates and nitrites. The calculations for the pounds of nitrogen per acre are also added.

TABLE I.—Rain and Snow at Ottawa, for the year ending February 28, 1915.

Month and Year.	Precipitation in Inches.			Nitrogen.				Pounds of Nitrogen per Acre.
	Rain.	Snow.	Total in Inches of Rain.	In Free Ammonia	In Albuminoid Ammonia	In Nitrates and Nitrites.	Total.	
1914.				p.p.m.[1]	p.p.m.	p.p.m.	p.p.m.	
March	0·40	9·75	1·37	·187	·196	·12	·503	·156
April	2·04	4·00	2·44	·476	·149	·137	·762	·427
May	0·30	....	0·30	·76	·15	·43	1·34	·091
June	2·21	....	2·21	·519	·082	·433	1·03	·518
July	1·41	....	1·41	·63	·12	·50	1·25	·400
August	2·38	....	2·38	·47	·60	·27	1·34	·725
September	2·09	....	2·09	·37	·163	·39	·92	·437
October	1·85	....	1·85	·62	·07	·36	1·05	·442
November	1·70	17·75	3·50	·38	·076	·29	·746	·446
December	0·66	18·00	2·46	·22	·161	·08	·46	·196
1915.								
January	0·97	21·50	3·12	·17	·16	·18	·51	·361
February	0·69	15·25	2·21	·13	·45	·71	1·29	·646
Total for 12 mons	16·70	86·25	25·34	....	....	....	....	4·905

p.p.m.=Parts per million.

We have already referred to the fact that the total precipitation for the year was much below the normal. The rainfall was particularly low, only 16·7 inches as compared with 25·14 inches, the average for the previous twenty-three years. May was exceptionally dry, with only ·30 inch. In three months, March, July, and October, the precipitation was between 1 and 2 inches, and in two months only, November and January, did it exceed 3·0 inches. Many of the showers during the growing season were exceedingly light, not furnishing a sufficient quantity, as collected on our experimental catchment area, for the purposes of analysis. These showers, though no doubt useful in refreshing vegetation, could not have added materially to the moisture content of the soil for subsequent crop use between rainfalls.

The total nitrogen for the year amounted to 4·905 pounds per acre, the average for the previous seven years being 6·182 pounds.

A study of table II permits a comparison of the annual precipitation and the amounts of nitrogen furnished per acre for the eight years that this examination has been in progress.

TABLE II.—Precipitation and Amount of Nitrogen per Acre, Ottawa, Ont., 1908-1915.

Year.	Rain in Inches.	Snow in Inches.	Total Precipitation in Inches of Rain.	Pounds of Nitrogen per Acre.
Year ending February 29, 1908	24·05	133·0	37·35	4·322
" " " 28, 1909	22·99	96·25	32·63	8·364
" " " 28, 1910	28·79	80·75	36·87	6·869
" " " 28, 1911	19·67	73·00	26·97	5·271
" " " 29, 1912	20·33	104·25	30·76	6·100
" " " 28, 1913	30·34	96·25	39·96	6·144
" " " 28, 1914	23·31	84·75	31·78	6·208
" " " 28, 1915	16·70	86·25	25·34	4·905
Average for 24 years	24·37	91·79	33·96	
" " 8 "	....	....	....	6·023

The data set forth in table III are of interest in showing the total nitrogen furnished per acre annually for the experimental period, 1908-1915, and in indicating the proportions of this nitrogen as found in the rain and snow respectively. The results allow us to conclude that from 80 to 85 per cent of the total nitrogen is to be found in the rain.

TABLE III.—Amounts of Nitrogen furnished by Rain and Snow, 1908-15.

Year.	Total.	By Rain.		By Snow.	
		Pounds.	Proportion.	Pounds.	Proportion.
	Pounds.		Per cent.		Per cent.
Year ending February 29, 1908	4·322	3·243	75	1·080	25[1]
" " " 28, 1909	8·364	7·528	90[2]	·836	10
" " " 28, 1910	6·869	5·830	85	1·040	15
" " " 28, 1911	5·271	4·424	84	·847	16
" " " 29, 1912	6·100	5·075	83	1·025	17
" " " 28, 1913	6·144	5·113	83	1·031	17
" " " 28, 1914	6·208	5·192	84	1·016	16
" " " 28, 1915	4·905	3·976	81	·929	19

[1]Snowfall exceptionally heavy.
[2]Rain abnormally rich in ammonia, due to bush fires.

The distribution or proportion of the various nitrogen compounds in the rain and snow is shown in table IV. The chief points of interest are the greater richness of the rain in the several nitrogen compounds, which has been observed from the first, and the somewhat larger than usual percentage of the total nitrogen of the rain present in the form of nitrates and nitrites.

TABLE IV.—Average Nitrogen content of Rain and Snow, Amount of Nitrogen per acre as Free and Albuminoid Ammonia and as Nitrates and Nitrites, 1914-15.

	Number of Samples Analysed.	Precipitation in Inches.	Nitrogen.								
			Parts per Million.				Percentage of Total.			Pounds per Acre.	
			In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Total.	In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	As Free and Albuminoid Ammonia.	As Nitrates and Nitrites.
Rain...	44	16·70	·400	·214	·450	1·064	38	20	42	2·320	1·702
Snow...	24	86·25	·176	·116	·159	·451	39	26	35	·571	·312

As remarked in previous reports, the amount of soluble nitrogen compounds that may serve as food for crops as furnished annually by the rain and snow is not large and cannot be regarded as an important factor in adding to the soil's store of nitrogen. We may, however, fairly assume, since this nitrogen is furnished in an immediately available form chiefly during the growing season, that the precipitation does act as a fertilizing agent of some value.

WELL WATERS FROM FARM HOMESTEADS.

The examination of well waters from farm homesteads, a work begun in the early days of the Farm's history, has been continued. During the year ending March 31, 1915, one hundred and ninety-five samples have been submitted to analysis and reported upon as to the wholesomeness of the supplies represented. A summary of the data is here given in tabular form, together with a very brief report as to the nature and potability of the water. To the sender, a more detailed report is forwarded, explaining the nature of the pollution (where such has been found) and the possibilities of purification.

In addition to the waters submitted to analysis, a considerable number of samples have been received which, owing to insufficient quantity, dirty containers or other cause which would vitiate the analytical results, have not been examined.

The summarized reports as to quality given in the last column of the table show that forty-nine were pronounced as pure and wholesome, fifty-four as suspicious and probably dangerous, thirty-six as very seriously polluted, while fifty-six samples were too saline for potable use.

The whole subject of the farm water supply has been repeatedly and recently discussed in the reports of this Division, and we think it scarcely necessary in this chapter to consider it in all its phases. Very briefly, the cause of pollution in the larger number of instances is the access to the well of drainage of an excretal character, from the stable, barn, or privy. The polluted wells, for the most part, are shallow, merely collectors of soakage water from the surrounding soil. When these wells are, for the sake of convenience, located near the farm buildings or in the barnyard, as is too frequently the case, contamination is practically inevitable.

The bored or drilled well, tapping a deep-seated source, is undoubtedly safer and more reliable than the shallow, ground-water well. Where the latter must be relied on, the surroundings for a radius of say 50 yards should be kept free from manure and filth. Preferably, this area should be sodded. As a further precautionary measure the shallow well may be lined to a depth of 10 or 12 feet and to a thickness of, say, 4 to 6 inches with cement or puddled clay, the lining projecting say, 6 to 12 inches above the mouth of the well, which should be protected with a well-fitting cover to keep out frogs, mice, etc.

An ample supply of pure water is assuredly one of the most valuable assets that a farm can possess, and no reasonable expense should be spared in the attempt to procure it. Impure water is always a menace; it is frequently the cause of typhoid fever, diarrhoea, and allied intestinal diseases. Pure water is one of the most potent factors for the good health of the farmer and his family, for the thrift of his stock, and the quality and wholesomeness of his dairy produce.

If the supply has been proved impure, our advice is abandon it at the earl· opportunity; no matter what means of purification are employed, such water must remain a source of more or less danger, for household purification methods can seldom be depended on at all times to give a satisfactory and absolutely safe water. As, however, it is not always possible to obtain immediately a pure supply, we would recommend the adoption of one or other of the two following methods, if analysis or the condition of the well or water point to pollution:

I. Boiling.—This will not make a bad water good, but it will destroy any disease germs that may be present. Boiling for ten or fifteen minutes all the water required for drinking or culinary purposes is the best safeguard that we can suggest.

II. Treatment with hypochlorite.—This method is strongly recommended by many sanitarians. It is carried out for a supply for the household, as follows:—

"Take a level teaspoonful of chloride of lime and rub with a small quantity of water to the consistency of cream and until the lumps have disappeared. Dilute this

with water, constantly rubbing and stirring, to a volume of about four cupfuls, and pour into a stoppered or well-corked bottle. This is the stock solution, of which a teaspoonful is added to every two gallons of the water to be treated. Stir well. In from ten to fifteen minutes all disease germs will be destroyed and the water will be safe. The stock solution will keep for at least a week. The chloride of lime should be purchased in metallic cases (tins) not cardboard boxes, which permit of its deterioration."

It will be observed that a number of the waters have been reported as saline. This means that their soluble mineral content is so high as to render them non-potable, or practically so, or that the character of this mineral matter is such as to make the waters more or less deleterious to health if continuously used. Very frequently the two conditions are associated and the high saline content is found to be made up in part of salts that have a decidedly medicinal effect on the system. In addition to sodium chloride (common salt), to which, unless in great excess, no great importance from the hygienic point of view need be attached, and calcium sulphate (sulphate of lime), which may be regarded as merely making the water excessively hard, we not infrequently find notable amounts of the sulphates of magnesium and sodium (Epsom salts and Glaubers salts) which impart a bitter taste to the water. Furthermore, these two compounds, if present in more than traces, render the water decidedly laxative. Though some systems in time become, in a large measure, habituated to the use of these impregnated waters, without apparently any serious symptoms developing, we cannot regard such supplies as wholesome, either for stock or domestic use. These saline waters for the most part are from districts of sparse and irregular precipitation, and where, as a result, a ground water supply cannot be depended on. They are as a rule from deep wells, which no doubt draw their supply from strata containing these soluble minerals.

Unfortunately this saline matter cannot be got rid of by any filtration or precipitation method practicable in the household, owing to its extreme solubility. Distillation must be resorted to; this will furnish a wholesome, potable water from the most highly impregnated supplies. In order that the farmer may avail himself of this method of purification, we recommend the use of a domestic or household still. These stills, several of which are upon the market, can be procured from firms dealing in druggists' supplies. They are simple in operation and can be used on the kitchen stove. The more commonly used sizes will furnish from one to two quarts of pure water per hour—a sufficiency for drinking purposes in the household—and the cost is from $10 to $15 apiece according to size, materials, and construction. Further information respecting these domestic stills, if required, can be obtained by addressing this Division.

In conclusion, we would say that if the farmer has any reason to doubt the purity of his supply he should have a sample examined. Farmers are invited to write to the Division of Chemistry, Central Experimental Farm, Ottawa, for a copy of the directions to be followed in the collection and shipment of the sample. No charge is made for the analysis, but the instructions furnished must be faithfully carried out, and the express charges on the water prepaid. Samples which have not been taken in accordance with our directions cannot be analysed.

ANALYSIS OF WELL WATERS, 1914-1915— Results Stated in Parts per Million.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Report.
1	Spences Bridge, B.C.	J.A.T.	6-4-14	......	......	......	6.0	720.0	450·0	270·0	Wholesome.
2	Spences Bridge, B.C.	J.A.T.	6-4-14	......	......	......	Free.	1,640·0	1,290·0	350·0	Slightly saline but wholesome.
3	Marshy Hope, N.S.	A.G.	6-4-14	·06	·20	·61	5·5	40·0	31·2	88·0	Suspicious.
4	Pickering, Ont.	H.D.B.	7-4-14	3·40	·48	Free.	190·0	960·0	816·0	144·0	Non-potable.
5	Carp, Ont.	O.M.G.	9-4-14	·03	·30	5·39	4·5	411·2	304·0	107·2	Suspicious.
6	Macleod, Alta.	E.N.	9-4-14	·12	·25	Free.	Free.	264·0	168·0	96·0	Non-potable.
7	St. Augustin, Que.	J.E.	9-4-14	·066	·317	1·40	Free.	140·0	80·0	60·0	Suspicious.
8	Camrose, Alta.	G.E.R.	14-4-14	1·55	·20	Free.	1,840·0	3,360·0	3,180·0	180·0	Strongly saline.
9	C. E. F., Ottawa.		15-4-14	·04	·06	1·16	7·5	311·2	231·2	80·0	Free from pollution.
10	Milford, Ont.	N.V.D.	15-4-14	·22	·22	5·36	850·0	1·653·2	1,452·0	201·2	Seriously polluted.
11	Finch, Ont.	F.D.S.	16-4-14	280·0	140·0	Free.	200·0	1,620·0	620·0	1,000·0	Polluted.
12	Invermere Co., C.B., N.S.	A.C.R.	21-4-14	·08	·06	·22	2,750·0	4,398·0	4,298·0	1,000·0	Strongly saline.
13	Big Stick Lake, Sask.	R.H.A.	24-4-14	3·58	1·52	·97	170·0	1,700·0	1,075·0	625·0	Unwholesome.
14	Bowesville, Ont.	J.S.M.	24-4-14	·03	·07	Free.	Free.	200·0	134·0	66·0	Excellent.
15	Bowesville, Ont.	J.S.M.	24-4-14	·06	·10	11·30	65·0	406·0	268·0	138·0	Seriously polluted.
16	Manitou, Man.	J. J. M.	27-4-14	1·16	·12	·27	4·5	488·8	388·0	100·8	Seriously polluted.
17	Grand Mannan, N.B.	S.H.J.	29-4-14	Free.	·04	·05	17·5	104·0	50·0	54·0	Wholesome.
18	Avonlea, Sask.	J.S.N.	9-5-14	·315	·215	·037	120·0	4,000·0	3,440·0	560·0	Strongly saline.
19	Aylmer, Que.	A.C.C.	11-5-14	·21	·06	Rree.	24·0	340·0	272·0	68·0	Seriously contaminated.
20	Tullisville, Sask.	L.A.P.	11-5-14	1·24	·28	Free.	170·0	2,480·0	1,840·0	640·0	Contaminated.
21	Beulah, Man.	C.E.E.	12-5-14	4·52	·19	Free.	450·0	2,912·0	2,612·0	300·0	Strongly saline.
22	Lombardy, Ont.	H.R.C.	12-5-14	·21	·20	4·38	27·0	......	......	......	Seriously contaminated.
23	Newboro', Ont.	J.M.T.	13-5-14	·34	·17	1·78	110·0	430·0	310·0	120·0	Polluted.
24	Carp, Ont.	E.R.K.	19-5-14	·12	·14	5·57	34·5	540·0	392·0	148·0	Seriously polluted.
25	Ottawa, Ont.	D.W.R.	20-5-14	·10	·14	5·40	12·0	296·0	180·0	116·0	Suspicious.
26	Ottawa, Ont.	J.B.	20-5-14	·12	·08	3·93	13·5	352·0	218·0	134·0	Suspicious.
27	Rosthern, Sask.	W.A.M.	22-5-14	4·76	·22	Free.	46·0	2·816·0	2·456·0	360·0	Non-potable, saline.
28	Rosthern, Sask.	W.A.M.	22-5-14	4·76	·22	Free.	46·0	2·816·0	2·456·0	360·0	Non-potable.
29	Theodore, Sask.	H.P.S.	22-5-14	·15	·16	3·51	17·0	1,372·0	1,020·0	352·0	Saline.
30	Laurentain View, Que.	J.A.S.	23-5-14	Free.	·02	2·74	6·0	292·0	192·0	160·0	Free from contamination
31	Dunham, Ont.	C.H.F.	27-5-14	Trace.	·09	2·87	4·5	114·0	49·2	64·8	Suspicious.
32	Compton, Que.	L.J.	28-5-14	Free.	·055	1·85	2·0	234·0	140·0	94·0	Free from pollution.
33	Medicine Hat, Alta.	G.R.T.	1-6-14	......	......	......	17·5	1,475·0	1,065·0	410·0	Slightly saline.
34	Russell, Man.	J.A.M.	2-6-14	·225	2·60	Free.	·05	769·6	474·4	295·2	Suspicious.
35	Aylmer, Que.	J.C.R.	5-6-14	·14	·32	·016	5·5	231·0	136·0	95·0	Suspicious.
36	Albert Head, Vancouver Is.	M.M.	8-6-14	......	......	......	2·5	250·0	150·0	100·0	Free from pollution.

ANALYSIS OF WELL WATERS, 1914-15.—Results stated in Parts per Million.—*Continued.*

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Report.
37	Parkland, Alta	W.B.	8-6-14	·12	·08	·165	39·0	2,072·0	2·012·0	60·0	Saline.
38	Thompson, Alta	J.J.E.	10-6-14				15·0	400·0	250·0	150·0	O. doubtfull purity.
39	Kemptville, Ont	W.J.P.	10-6-14	Free.	·09	3·86	5·5	246·0	111·0	135·0	Suspicious.
40	Ramsayville, Ont	J.H.K.	12-6-14				5·100·0	8,450·0			Saline.
41	Point du Chene, N.B.	J.S.M.	17-6-14	Trace.	·04	6·63	65·0	400·0	232·0	168·0	Gravely suspicious.
42	C.E.F., Ottawa		13-6-14	Free.	·02	1·119	8·0	352·0	272·0	80·0	Pure and wholesome.
43	Nicolet, Que	S.S.H.	13-6-14	8·88	·88	Free.	2,650·0	5,528·4	5,270·4	250·0	Strongly saline.
44	Ottawa, Ont	G.H.	15-6-14	·18	·08	2·36	15·5	328·0			Gravely suspicious.
45	Perley, Sask	F.N.N.	25-6-14				17·5	5,650·0			Strongly saline.
46	Macdonald, Man	R.A.C.	15-6-14	3·08	·05	Free.	2,400·0	7,202·0	6,258·0	944·0	Strongly saline.
47	Almonte, Ont	P.C.D.	16-6-14	·215	·17	6·75	55·0	630·0	482·0	148·0	Contaminated.
48	Almonte, Ont	J.J.H.	16-6-14	Free.	·12	2·10	55·0	518·8	438·0	80·8	Gravely suspicious.
49	Milk River, Alta	S.B.	26-6-14	1·69	·07	Free.	48·5	1,860·0	1,744·0	116·0	Saline.
50	Black Foot, Alta	C.H.L.	22-6-14				50·0	2,326·0	1,802·0	524·0	Strongly saline.
51	Aultsville, Ont	E.D.F.	22-6-14	·04	·02	·165	5·0	264·0	178·0	86·0	Pure and wholesome.
52	Whitla, Alta	A.E.S.	24-6-14	·065	·11	·045	10·0	1,938·0	1,818·0	120·0	Saline.
53	Maxville, Ont	D.McD.	26-6-14	·166	·166	21·08	200·0	720·0	262·0	358·0	Seriously polluted.
54	Winnifred, Alta	P.O.W.	26-6-14	Free.	·02	·36	9·0	1,624·0	1,392·0	232·0	Saline.
55	Fort Qu'Appelle, Sask	W.M.T.	29-6-14	·08	·10	Free.	46·0	1,541·2	1,249·2	292·0	Saline.
56	Fort Qu'Appelle, Sask	W.M.T.	29-6-14	·82	·26	Free.	61·0	2,106·0	1,708·0	398·0	Saline.
57	York Mills, Ont	M.W.B.	30-6-14	·075	·10	Free.	2·0	645·2	517·2	128·0	Free from contamination
58	York Mills, Ont	M.W.B.	30-6-14	·075	,16	Free.	6·0	328·0	248·0	80·0	Free from contamination
59	Allan, Sask	H.J.J.	2-7-14				24·0	2,552·2	2,013·2	542·0	Strongly saline.
60	Lancaster, Ont	A.F.C.	4-7-14	·06	·24	Free.	88·5	648·0	313·0	335·0	Suspicious.
61	Chateauguay, Que	L.S.M.	6-7-14				16·0	610·0	480·0	130·0	Probably wholesome.
62	C.E.F., Ottawa		8-7-14	Free.	·04	1·24	8·5	354·8	273·6	81·2	Pure and wholesome.
63	Westboro, Ont	R.	8-7-14	·06	·08	3·38	17·0	516·0	354·0	162·0	Suspicious.
64	Lakefield, Ont	J.C.	8-7-14	1·82	·08	Free.		426·0	338·0	88·0	Contaminated.
65	Norwood, Ont	G. L.	8-7-14	Free.	·09	2·67	8·5	334·0	289·2	44·8	Suspicious.
66	Banff, Alta	D.P.M.	9-7-14	Free.	·03	·066	Free.	172·0	95·2	76·8	Pure and wholesome.
67	Carp, Ont	E.H.G.	10-7-14	·125	·26	5·34	33·0	504·0	402·0	102·0	Seriously contaminated.
68	Rosthern, Sask	E. F.	10-7-14	·21	·05	·22	4·0	308·0	280·0	28·0	Not a first-class water.
69	Woodlawn, Ont	J.A.M.	11-7-14	·22	·09	·08	3·5	255·6	221·6	34·0	Very suspicious
70	Haley, Ont	A.M.H.	13-7-14	·04	·41	Free.	60·0	946·0	598·8	347·2	Probably dangerous.
71	Cowichan, B.C	M.W.C.	13-7-14	Free.	·11	·033	19,000·0	32,067·0	28,233·0	3,834·0	Strongly saline.
72	Westboro, Ont	P.C.	15-7-14	·03	·03	0·00	3·5	149·6	121·6	28·0	Pure and wholesome.
73	Kitimat, B.C	G.L.A.	16-71-4	·11	·17	Free.	140·0	349·6	265·6	84·0	Suspicious.

74	Blackfoot, Alta	C.H.L.	15-7-14	·20	·90	3·30	53·5	2,662·0	2,086·0	576·0	Saline.
75	Expanse, Alta	R.A.	17-7-14	Trace.	·20	·08	300·0	8,212·0	7,290·0	922·0	Strongly saline.
76	Lennoxville, Que	E.F.	18-7-14	2·25	·198	10·82	32·0	274·0	160·0	114·0	Seriously polluted.
77	Lennoxvile, Que	E.F.	18-7-14	·01	·049	2·57	5·0	140·0	93·0	47·0	Not a first-class water.
78	Lennoxville, Que	E.F.	18-7-14	·194	·07	1·01	1·8	63·0	36·0	27·0	Gravely suspicious.
79	Lennoxville, Que	E.F.	18-7-14	·01	·02	2·68	9·8	250·0	155·0	95·0	Suspicious.
80	South Bay, N.B.	F.H.	21-7-14	·01	·01	·23	12·0	132·0	91·0	41·0	Excellent.
81	Grenfell, Sask	F.J.	25-7-14	·76	·73		70·0	6,468·0	5,373·0	1,095·0	Strongly saline.
82	Macleod, Alta	E.H.M.	28-7-14				2·5	410·0	384·0	26·0	Probably a good water.
83	Glen Nevis, Ont	J.S.M.	1-8-14				700·0	2,442·0	2,140·0	302·0	Saline.
84	Parkland, Alta	J.S.	31-7-14					3,240·0	3,169·0	71·0	Saline.
85	Collins, Sask	W.K.B.	7-8-14	2·82	·12	Free.	26·5	2,615·0	2,180·0	435·0	Saline.
86	Plantagenet, Ont	P.C.D.	4-8-14				3·0	154·0	136·0	18·0	Suspicious.
87	Mille Roche, Ont	A.S.	4-8-14					292·0	244·0	48·0	Probably a good water.
88	Ottawa, Ont	B.L.	4-8-14	·37	·075	·06	40·0	405·0	376·0	29·0	Dangerous.
89	Almonte, Ont	J.M.	6-8-14	·088	·045	2·92	57·0	555·0	489·0	66·0	Contaminated.
90	Fredericton, N.B.	A.R.M.	7-8-14	·51	·17		30·0	238·0	130·0	108·0	Seriously polluted.
91	Ardock, Ont	W.J.C.	11-8-14	Trace.	·13	8·07	76·0	618·0	412·0	206·0	Seriously polluted.
92	Tillsonburg, Ont	V.W.	14-8-14	·16	·02	Free.	4·0	446·4	415·2	31·2	Suspicious.
93	Tillsonburg, Ont	V.W.	14-8-14	·01	·02	·1	Free.	337·6	289·6	48·0	Pure and wholesome.
94	Tillsonburg, Ont	V.W.	14-8-14	Free.	·03	4·12	122·0	695·2	466·4	228·8	Contaminated.
95	Arborfield, Sask	W.E.L.	4-8-14				350·0	8,982·0	7,537·0	1,445·0	Saline.
96	Elgin, Ont	W.H.P.	14-8-14				64·0	1,024·0	762·0	262·0	Suspicious.
97	Agassiz, B.C.	S.F.	18-8-14				Free.				Non-potable.
98	Agazziz, B.C.	S.F.	18-8-14				Free.				Non-potable.
99	Cayley, Alta	H.S.	20-8-14	·85	·13	Free.	70·0	2,429·0	2,364·0	65·0	Strongly saline.
100	Beachburg, Ont	W.Mc.	22-8-14	·14	·05	·12	5·0	256·0	180·0	76·0	Contaminated.
101	Stafford, Ont	H.B.H.	25-8-14	·12	·20	·016	24·0	462·8	360·8	102·0	Polluted.
102	Plantagenet, Ont	[illegible]D.	27-8-14	·08	·15	·30	2·5	140·8	84·8	56·0	Free from pollution.
103	E. Kelowna, B.C.	L.H.	29-8-14	·04	1·60	·07	1·0	150·0	80·0	70·0	Suspicious.
104	S. Indian, Ont	J.Mc.	31-8-14	·04	·16	·20	45·5	422·0	264·0	158·0	Suspicious.
105	Banff, Alta	D.P.M.	10-9-14	·033	·10	·039	0·75	235·0	155·0	80·0	Free from pollution.
106	St. Hyacinthe, Que	J.C.D.	4-9-14	·04	·08	Free.	340·0	1,104·8	858·8	246·0	Slightly saline.
107	St. Hyacinthe, Que	J.C.D.	4-9-14	5·26	·54	·74					Seriously polluted.
108	C. E. F., Ottawa		11-9-14	Free.	·02	1·04	9·5	338·4	258·0	80·4	Pure and wholesome.
109	Summerland, B.C.	J.A.K.	22-9-14				20·0	1,233·6	934·4	299·2	Saline.
110	Summerland, B.C.	J.A.K.	22-9-14				2·5	230·8	172·4	58·4	Saline.
111	Brandon, Man	E.F.	22-9-14	·645	·13	Free.	32·5	502·4	396·0	106·4	Seriously polluted.
112	St. Eugene, Ont	E.P.L.	24-9-14	·175	·36	5·60	62·0	652·4	460·4	192·0	Seriously polluted.
113	Todmorden, Ont	J.C.W.	29-9-14	·045	·42	2·70	270·0	1,703·2	1,086·8	616·4	Gravely suspicious.
114	Sardis, B.C.	L.M.	1-10-14				Free.	1·53	99·5	53·5	Free from pollution.
115	Sardis, B.C.	L.M.	1-10-14				Free.	211·5	141·0	70·5	Free from pollution.
116	Sardis, B.C.	L.M.	1-10-14				Free.	299·5	195·5	104·0	Free from pollution.
117	Sardis, B.C.	L.M.	1-10-14				Free.	241·5			Free from pollution.
118	Sardis, B.C.	L.M.	1-10-14				Free.	156·5			Free from pollution.
119	Sardis, B.C.	L.M.	1-10-14				Free.	185·5			Free from pollution.
120	Elmsdale, P.E.I.	W.C.Mc.	2-10-14	·03	·06	3·30	44·0	187·0	86·3	100·7	Gravely suspicious.
121	Carp, Ont	E.H.C.	6-10-14	·10	·155	5·73	12·0	230·0	152·0	78·0	Seriously polluted.
122	Sidney, B.C.	S.S.	6-10-14	·20	·335	3·17	10·5	212·4	98·4	114·0	Seriously polluted.
123	Sidney, B.C.	S.S.	6-10-14	·04	·03	3·30	10·0	170·4	93·6	76·8	Suspicious.

ANALYSIS OF WELL WATERS, 1914-15.—Results stated in Parts per Million.—*Continued.*

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Report.
124	Sidney, B.C.	S.S.	6-10-14	·04	·04	3·37	11·5	128·8	76·8	72·0	Highly suspicious.
125	Sidney, B. C.	S.S.	6-10-14	·004	·04	·014	8·0	168·0	108·8	59·2	Excellent.
126	Rereshill, Sask.	D.M.	7-10-14				12·0	1,585·0	1,370·0	215·0	Saline.
127	C. E. F., Ottawa.		8-10-14	Free.	·01	1·17	8·5	388·4	218·8	169·6	Pure and wholesome.
128	Waseca, Sask.	H.H.	13-10-14				Free.	800·8	638·8	162·0	Safe and wholesome.
129	Wyman, Que.	M.M.	16-10-14	Trace.	·04	·26	Free.	295·0	195·0	100·0	Free from pollution.
130	Queens Co., N.B.	J.	17-10-14				Free.	122·0	38·0	84·0	Free from pollution.
131	Gravelbourg, Sask.	C.H.H.	21-10-14	·037	·33	·099	4·5	615·0	320·0	295·0	Not a first-class water.
132	Orillia, Ont.	R.A.H.	26-10-14	·105	·045	·045	1·0	378·0	278·0	100·0	Suspicious.
133	Jacquet River, N.B.	F.M.D.	30-10-14	·04	·105	6·37	36·0	242·0	188·0	54·0	Suspicious.
134	Orillia, Ont.	R.A.H.	26-10-14	Free.	·004	·99	·7	254·0	158·0	96·0	Excellent.
135	Sydenham, Ont.	W.E.L.	31-10-14	1·40	·05	7·10	3,650·0	8,200·0	6,195·0	2,005·0	Strongly saline.
136	Henryville, Que.	A.E.Mc	31-10-14	·19	·19	16·63	100·0	1,200·0	860·0	340·0	Strongly suspicious.
137	Chesterville, Ont.	H.J.J.	2-11-14	1·05	·056	Free.	400·0	1,310·0	945·0	365·0	Polluted.
138	Henryville, Que.	E.R.	3-11-14	·81	·07	Free.	64·0	600·0	400·0	200·0	Suspicious.
139	Lotbiniere, Que.	U.H.	7-11-14	4·08	·24	Free.	425·0	7,405·0	7,240·0	165·0	Strongly saline.
140	Leavitt, Alta.	J.F.H.	7-11-14	·01	·17	1·73	28·0	4,060·0	3,110·0	950·0	Strongly saline.
141	Harrowsmith, Ont.	W.E.L.	7-11-14	1·56	·04	3·04	4·100·0	9,478·0	7,108·0	2,370·0	Strongly saline.
142	Grondines, Que.	E.A.	9-11-14	·03	·18	11·50	18·0	426·0	248·0	178·0	Contaminated.
143	North Portal, Sask.	B.B.	10-11-14				64·0	1,768·0	1,656·0	112·0	Saline.
144	Maple Dale, Sask.	H.S.H.	14-11-14				175·0	4,960·0	4,224·0	736·0	Strongly saline.
145	C. E. F., Ottawa.		16-11-14	·05	·07	·95	9·5	322·0	230·0	92·0	Pure and wholesome.
146	Billing's Bridge, Ont	H.I.	16-11-14	·44	·04	Free.	4·5	256·0	179·2	76·8	Seriously polluted.
147	Billing's Bridge, Ont	H.I.	16-11-14	Trace.	·19	·60	6·5	306·0	212·0	94·0	Polluted.
148	Westmeath, Ont.	R.C.Mc.	21-11-14	·75	·24	·11	11·5	292·0	172·0	120·0	Contaminated.
149	Maryfield, Sask.	G.H.P.	24-11-14	1·88	·73	·36	1,600·0	3,884·0	3,416·0	468·0	Strongly saline.
150	Saanichton, B.C.	J.M.H.	1-12-14				27·0	237·0	160·0	77·0	Possibly a good water.
151	Bellview, Ont.	R.R.	1-12-14				660·0	1,153·0	1,029·0	124·0	Slightly saline.
152	Westboro, Ont.	E.R.W.	2-12-14	·05	·105	1·14	25·0	507·0	420·0	87·0	Non-portable.
153	Greenwich, N.S.	B.L.B.	7-12-14	·04	·12	·56	11·0	83·0	33·0	50·0	Gravely suspicious.
154	Ramsayville, Ont.	R.K.	7-12-14	9·68	·25	1·42	44·0	9,155·0	8,785·0	370·0	Strongly saline.
155	Quyon, Ont.	W.H.M.	11-12-14	·10	·18	·20	6·6	250·0	180·0	70·0	Suspicious.
156	Ridgemont, Ont.	P.F.	11-12-14	·02	·70	1·51	214·0	698·0	588·0	110·0	Seriously polluted.
157	Naseby, Sask.	A.A.	21-12-14				80·0	5,010·0	4,415·0	595·0	Strongly saline.
158	Grant, Ont.	J.Mc.	28-12-14	2·45	·40	11·43	170·0	2,257·0	1,797·0	460·0	Gravely suspicious.
159	Sidney, B.C.	E.F.	29-12-14	Free.	Free.	1·66	7·5	145·0	99·0	46·0	Suspicious.
160	Sutherland, Sask.	S.N.S.	21-12-14	2·80	·19	3·69	160·0	2,903·0	2,496·0	407·0	Slightly saline.

161	Sidney, B.C.	E.F.	29-12-14	Free.	Free.	·99	8·0	125·0	83·0	42·0	Excellent.
162	Trois Sammons, Que.	A.E.A.	31-12-14	·02	1·80	1·24	8·1	372·0	197·0	175·0	Contaminated.
163	C. E. F., Ottawa	....	8-1-15	Free.	·01	·9	9·0	350·0	301·0	49·0	Pure and wholesome.
164	Meyronne, Sask.	A.R.C.	9-1-15	·65	·18	·69	19·0	2,047·0	1,824·0	223·0	Distinctly saline.
165	Sussex, N.B.	J.W.	18-1-15	Trace.	Free.	2·79	4·6	145·0	43·0	102·0	Free from pollution.
166	St. John, N.B.	F.A.G.	18-1-15	·66	Trace.	·06	4·0	157·0	115·0	42·0	Suspicious.
167	Pt. Dover, Ont.	H.M.	25-1-15	·56	·10	Trace.	1·5	338·0	124·0	214·0	Non-potable.
168	C. E. F., Ottawa		6-2-15	·02	Trace.	1·03	9·7	310·0	292·0	18·0	Pure and wholesome.
169	Waltham, Que.	C.B.D.	2-2-15	·37	·13	·04	2·0	36·0	30·0	6·0	Probably pure.
170	Bresaylor, Sask.	A.Mc.	4-2-15	....	....	....	7·3	1,673·0	1,340·0	333·0	Saline.
171	Russell, Ont.	A.A.R.	8-2-15	....	....	....	4,260·0	7,458·0	7,048·0	410·0	Strongly saline.
172	Fredericton, N.B.	J.S.A.	7-2-15	·47	·17	....	1·1	46·0	25·0	21·0	Suspicious.
173	Pinkham, Sask.	A.B.	19-2-15	·08	·35	·08	10·2	6·000·0	5,173·0	827·0	Strongly saline.
174	Pinkham, Sask.	A.B.	19-2-15	4·84	·16	....	12·2	1,560·0	1,354·0	206·0	Slightly saline.
175	Westboro, Ont.	N.S.Mc.	20-2-15	·03	·03	10·47	35·2	938·0	440·0	498·0	Gravely suspicious.
176	Cap Rouge, Que.	G.A.L.	20-2-15	·08	·22	·53	6·6	388·0	299·0	89·0	Suspicious.
177	Foam Lake, Sask.	F.T.S.	26-2-15	....	....	....	189·0	18,520·0	13,888·0	4·632·0	Strongly saline.
178	Quill Lake, Sask.	H.S.P.	1-3-15	·28	·09	·69	6·6	1,454·0	1,166·0	288·0	Saline.
179	Wilkie, Sask.	W.A.J.	3-3-15	·07	·295	·008	Trace.	246·0	148·0	98·0	Free from contamination
180	Mantario, Sask.	D.Mc.	12-3-15	·30	·29	·21	14·0	1,828·0	1,504·0	324·0	Saline.
181	Nepean	C.E.F.	16-3-15	·15	·04	·54	10·1	352·0	253·0	99·0	Pure and wholesome.
182	Masset, B.C.	J.M.	16-3-15	....	....	....	27·6	150·0	72·0	78·0	Possibly good water.
183	Ottawa, Ont.	R.O.G.C	17-3-15	·09	·06	1·45	2·6	78·0	36·0	42·0	Polluted.
184	Duncans, B.C.	W.V.	20-3-15	·04	·09	·032	5·2	130·0	126·0	4·0	Free from pollution.
185	Duncans, B.C.	W.V.	20-3-15	Trace.	·26	·032	10·2	76·0	69·0	7·0	Free from pollution.
186	Seven Persons, Alta.	D.M.	22-3-15	2·03	·09	·19	45·4	4,834·0	4,100·0	734·0	Strongly saline.
187	Outram, Sask.	J.T.T.	24-3-15	2·00	·18	·15	54·0	4,218·0	3,704·0	514·0	Strongly saline.
188	Lennoxville, Que.	B.C.	25-3-15	·04	·05	·71	1·0	66·0	16·0	50·0	Excellent.
189	Cabri, Sask.	C.H.L.	25-3-15	2·19	·155	Free.	515·7	3,558·0	2,973·0	585·0	Strongly saline.
190	Billing's Bridge, Ont.	H.D.	25-3-15	·28	·30	6·30	48·6	636·0	500·0	136·0	Seriously polluted.
191	Billing's Bridge, Ont.	H.D.	25-3-15	2·25	·59	12·47	62·6	796·0	497·0	299·0	Seriously polluted.
192	Billing's Bridge, Ont.	J.D.	25-3-15	1·70	·48	·214	20·0	422·0	316·0	106·0	Seriously polluted.
193	Grandview, Man.	W.M.	26-3-15	1·96	·18	·80	407·8	4,366·0	3,274·0	1,092·0	Strongly saline.
194	Fredericton, N.B.	J.W.Mc.	31-3-15	·18	·11	Free.	·8	76·0	29·0	47·0	Free from pollution.
195	Quesnel, B.C.	C.W.	15-2-15	·16	·10	....	6·1	620·0	420·0	200·0	Suspicious.

DOMINION EXPERIMENTAL FARMS

DEPARTMENT OF AGRICULTURE.

DOMINION OF CANADA

REPORT

FROM THE

DIVISION OF FIELD HUSBANDRY

FOR THE YEAR ENDING MARCH 31, 1915.

PREPARED BY

Acting Assistant Dominion Field Husbandman, Central Farm	W. L. Graham, B.S.A.
Superintendent—	
Experimental Station, Charlottetown, P.E.I.	J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S.	W. W. Baird, B.S.A.
Experimental Station, Kentville, N.S.	W. Saxby Blair.
Experimental Station, Fredericton, N.B.	W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, Qué.	Jos. Bégin.
Experimental Station, Cap Rouge, Que.	G. A. Langelier.
Experimental Farm, Brandon, Man.	W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask.	K. McBean, B.S.A.
Experimental Station, Rosthern, Sask.	Wm. A. Munro, B.A., B.S.A.
Experimental Station, Scott, Sask.	M. J. Tinline, B.S.A. (Acting).
Experimental Station, Lethbridge, Alta.	W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta.	G. H. Hutton, B.S.A.
Experimental Station, Invermere, B.C.	G. E. Parham.
Experimental Farm, Agassiz, B.C.	P. H. Moore, B.S.A.
Experimental Station, Sidney, B.C.	S. Spencer, Foreman-Manager.

REPORT

FROM THE

DIVISION OF FIELD HUSBANDRY

CENTRAL EXPERIMENTAL FARM

OTTAWA, March 31, 1915.

J. H. GRISDALE, Esq., B. Agr.,
Director of Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith reports of the work in Field Husbandry at the Central Experimental Farm and the branch Farms and Stations during the year 1914.

The work of this Division is of a practical character, and the experiments and investigations may be briefly outlined as follows:—

1. Investigation of the relative merits of different crop rotations, including special rotations for "dry farming" conditions.
2. Studies in the methods of culture of, and curing, field crops. A series of cultural experiments adapted to prairie conditions has now been under way four years on each of the six prairie Farms. These tests involve approximately five hundred plots on each Farm, and include twelve different lines of investigation.
3. Determination of the costs of growing field crops under regular farm conditions.
4. Experiments to show the value of underdrainage and irrigation.
5. Studies of the influence of size and character of cultural implements on cost of crop production.
6. Comparisons (in a limited way) of various grains and forage crops as food producers.

As explained in the report of 1914, the comparatively small number of field experiments conducted at the Central Experimental Farm is due to the present lack of sufficient land suitable for such purposes, and until suitable land is made available it will be impossible for the Division to do the most efficient service for the agriculture of the district it represents.

I have the honour to be, sir,
Your obedient servant,

W. L. GRAHAM,
Acting Assistant Dominion Field Husbandman.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

REPORT OF THE ACTING ASST. FIELD HUSBANDMAN, W. L. GRAHAM, B.S.A.

WEATHER CONDITIONS AND CROP NOTES, 1914.

The fore part of the season 1914 was unfavourable for crops. Meadows were badly winter-killed, and spring seeding commenced later than the average date for the past eleven years. Mangels and corn were sown during the last week of May and the first week of June, but the seed germinated slowly and unevenly on account of the drought. The growth of hay was also checked, yielding an average of 2 tons per acre. Straw was short but oats filled well, and on this Farm yielded 65 bushels per acre. The month of September was fine, with no damaging frosts, and corn made remarkable growth until harvested during the latter part of the month, yielding 14½ tons per acre. Roots also grew well and yielded nearly up to the average for the Farm. The autumn continued fine, and ploughing was practically finished by November 10.

The following record regarding field operations and the weather may be of interest:—

First date of sowing field grain, 1914	April 25.
First date of sowing field grain, average of eleven years	April 23.
Earliest date of sowing field grain, 1903 to 1914	April 10 (1910).
Latest date of commencing seeding field grain, 1903 to 1914	May 4 (1904).
First date of sowing mangels, 1914	May 8.
Date of sowing potatoes, 1914	May 27.
First date of sowing corn, 1914	May 22.
Date of commencing hay harvest, 1914	July 2.
Date of commencing grain harvest, 1914	August 6.
Date of commencing corn cutting, 1914	September 15.
Date of harvesting mangels, 1914	October 15.
Date of last ploughing, 1914	November 10.

SOME Weather Observations taken at Central Experimental Farm, Ottawa, 1914.

Month.	Temperature F.			Precipitation.				Total Sunshine.
	Mean.	Highest.	Lowest.	Rain-fall.	Snow-fall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	11·46	41·0	−30·0	0·64	30·50	3·68	0·90	98·6
February	6·13	42·0	−30·2	....	11·00	1·10	0·55	188·0
March	25·15	48·0	−2·0	0·40	9·75	1·36	0·40	150·3
April	38·74	70·0	13·0	2·04	4·00	2·47	0·77	181·0
May	59·50	92·8	31·0	0·30	....	0·30	0·16	275·1
June	63·13	91·0	38·0	2·21	....	2·21	0·65	270·2
July	68·75	92·0	44·2	1·41	....	1·41	0·54	295·7
August	65·55	90·0	41·0	2·38	....	2·38	0·60	233·7
September	58·11	92·0	30·0	2·09	....	2·09	0·61	224·8
October	49·17	77·0	22·0	1·85	S.	1·85	0·46	143·5
November	30·29	64·6	−2·2	1·70	17·75	3·50	1·18	76·9
December	16·88	45·6	−25·0	0·66	18·00	2·46	0·80	91·5
Total for year				15·68	91·00	24·81		
Average for twelve years				....	....	32·58		
Total for six growing months April to September				....	....	10·86		
Average of twelve years for six growing months April to September				....	....	16·88		

FIELD CROP YIELDS.

The following table includes the yields of field crops at the Central Farm in 1914. They are slightly better than those of last season, but are still below the average of previous years.

YIELDS of Field Crops, Central Farm, 1914.

Crop.	Area.	Total yield.				Average yield per acre.			
	Acres.	Tons.	Lb.	Bush.	Lb.	Tons	Lb.	Bush.	Lb.
Oats	40·00			2,600				65	
Oat straw	40·00	41	1,520			1	88		
Corn	32·00	464				14	1,000		
Roots	4·00	68		2,260	40	17		565	10
Potatoes	4·00	44	1,597	1,493	17	11	399	373	18
Hay	28·00	56				2			

COST OF PRODUCTION OF FIELD CROPS.

The cost of production per unit is high, as the yields in 1914 were comparatively low. Figures are given herewith for mangels, corn, oats, and hay grown in field lots.

COST OF PRODUCTION OF MANGELS.

Four acres of mangels were grown in a three-year rotation of mangels, grain, clover hay. The clover sod was ploughed shallow early in August, top worked and ribbed up in late autumn, in part preparation for the mangels.

Number of acres, 4.	
Rent of land at $3 per acre	$12 00
Use of machinery at 60 cents per acre	2 40
Third share of manure, at rate of 18 tons per acre, at $1 per ton	24 00
Ploughing in autumn 16 hours 4-horse team at 48 cents	7 68
Discing in autumn 12 hours 4-horse team at 48 cents	5 76
Ribbing in autumn 4 hours 2-horse team at 34 cents	1 36
Discing in spring, 6 hours 4-horse team at 48 cents	2 88
Discing, 8 hours, 3-horse team at 41 cents	3 28
Harrowing 2 hours 2-horse team at 34 cents	68
Rolling 4 hours 2-horse team at 34 cents	1 36
Drilling 8 hours 2-horse team at 34 cents	2 72
Seed 40 pounds at 25 cents	10 00
Sowing 24 hours manual labour at 17 cents	4 08
Hoeing 120 hours manual labour at 17 cents	20 40
Cultivating 15 hours 2-horse team at 34 cents	5 10
Cultivating 8 hours single horse at 27 cents	2 16
Pulling, loading and unloading 208 hours manual labour at 17 cents	35 36
Hauling, 26 hours 2-horse team at 34 cents	8 84
Total cost for 4 acres	$ 150 06
Cost per acre	37 52
Yield per acre . . bush.	565
Yield per acre . . tons.	17
Cost per bushel . . cents.	6·64
Cost per ton . . $	2 21

COST OF PRODUCTION OF ENSILAGE CORN.

Thirty-two acres of ensilage corn were grown in a three-year rotation of corn, grain, clover hay. The land was manured at the rate of 18 tons per acre and spring ploughed, turning under the manure and the growth of clover.

Number of acres, 32—	
Rent of land at $3 per acre	$ 96 00
Use of machinery at 60 cents per acre	19 20
Third share of manure at rate of 18 tons per acre, at $1 per ton	192 00
Ploughing 128 hours 3-horse team at 41 cents	52 48
Discing 45 hours 4-horse team at 48 cents	21 60
Discing 12 hours 3-horse team at 41 cents	4 92
Seed 16 bushels at $2 per bushel	32 00
Seeding 16 hours 2-horse team at 34 cents	5 44
Rolling 16 hours 2-horse team at 34 cents	5 44
Cultivating three times 108 hours 2-horse team at 34 cents	36 72
Cultivating 64 hours single horse at 27 cents	17 28
Hoeing 256 hours manual labour at 17 cents	43 52
Cutting 53 hours 3-horse team at 41 cents	21 73
Hauling 154 hours 2-horse team at 34 cents	52 36
Loading, unloading, tramping, etc., 216 hours manual labour at 17 cents.	36 72
Man at engine 54 hours manual labour at 17 cents	9 18
Twine 160 pounds at 13 cents	20 80
Total cost for 32 acres	$ 667 39
Cost per acre	20 85
Yield per acre . . tons.	14·5
Cost per ton . . $	1 44

COST OF PRODUCTION OF OATS.

Forty acres of oats were grown in a three-year rotation of corn, oats, clover hay. The corn ground was ploughed in the autumn, and with the oats was seeded a heavy mixture of timothy and clover.

Number of acres, 40—	
Rent of land at $3 per acre	$ 120 00
Use of machinery at 60 cents per acre	24 00
Third share of manure, at rate of 18 tons per acre at $1 per ton	240 00
Ploughing in autumn, 104 hours 3-horse team at 41 cents	42 64
Discing in autumn, 26 hours 4-horse team at 48 cents	12 48
Discing 48 hours 4-horse team at 48 cents	23 04
Discing 22 hours 3-horse team at 41 cents	9 02
Harrowing 20 hours 2-horse team at 34 cents	6 80
Seeding 21 hours 3-horse team at 41 cents	8 61
Rolling 18 hours 2-horse team at 34 cents	6 12
Cutting 27 hours 3-horse team at 41 cents	11 07
Twine 120 pounds at 13 cents	15 60
Stooking 55 hours manual labour at 17 cents	9 35
Hauling 42 hours 2-horse team at 27 cents	11 34
Loading and unloading 90 hours manual labour at 17 cents	15 30
Threshing 2,602 bushels at 1⅝ cents per bushel	43 37
Total cost for 40 acres	$ 598 74
Cost per acre	14 97
Yield of grain per acre ..bush.	65
Yield of straw per acre ..tons.	1·04
Cost per bushel of grain (grain valued at 34 cents per bushel and straw at $4 per ton) ..cents.	19·39
Cost per ton of straw ..$	2 27

NOTE.—The relative costs of grain and straw are estimated in the following manner.

Total revenue per acre from grain and straw is (65 bushels at 34 cents) + (1·04 tons at $4.) = $26.26.

When revenue is $26.26 cost to produce is $14.97.

When revenue (from 65 bushels grain) is $22.10 cost to produce per bushel is

$$\frac{\$22.10 \times 14.97}{\$26.26 \times 65} = 19 \cdot 39 \text{ cents.}$$

When revenue (from 1·04 tons straw) is $4.16, cost to produce per ton is

$$\frac{4 \cdot 16 \times 14 \cdot 97}{26 \cdot 26 \times 1 \cdot 04} = \$2.27.$$

COST OF PRODUCTION OF HAY.

Twenty-eight acres of hay were grown in a three-year rotation of corn, oats, clover hay. The yield was low on account of the stand being badly winter-killed. Also the excessive drought during the growing season checked its growth. Consequently, the cost of production per ton is comparatively high.

Number of acres, 28—	
Rent of land at $3 per acre	$ 84 00
Use of machinery at 60 cents per acre	16 80
Third share of manure, at rate of 18 tons per acre, at $1 per ton	168 00
Seed:—10 pounds red clover at 20 cents; 2 pounds alsike at 21 cents; 6 pounds alfalfa at 16 cents; 6 pounds timothy at 8½ cents	108 92
Cutting 39 hours 2-horse team at 34 cents	13 26
Raking 9 hours 2-horse team at 34 cents	3 06
Raking 10½ hours single horse at 27 cents	2 84
Hauling 47½ hours 2-horse team at 34 cents	16 15
Loading and unloading 120 hours manual labour at 17 cents	20 40
Coiling 44 hours manual labour at 17 cents	7 48
Total cost for 28 acres	$ 440 91
Cost per acre	15 75
Yield per acre ..tons.	2
Cost per ton ..$	7 87

In the following table is summarized the cost of production of mangels, corn, oats and hay as given in detail preceding.

Cost of Production of Field Crops, Central Farm, 1914.

Crop.	Area.	Yield per acre.		Cost to produce.		
				Per acre.	Per ton.	Per bushel.
	Acres.	Tons.	Bush.	$ c.	$ c.	Cents.
Mangels	4·00	17	565	37 52	2 21	6·64
Ensilage corn	32·00	14·5	......	20 85	1 44	......
Oats	40·00	......	65	14 97	......	19·39
Oat straw	40·00	1·04	......	......	......	......
Hay	28·00	2	......	15 75	7 87	......

ROTATION OF CROPS.

The line of farming engaged in will determine to a great extent the kinds and relative amounts of crops that will be grown. For this reason it is impossible to outline, definitely, a rotation that would be most suitable and profitable for all. However, it may be stated that a good rotation includes hoed, cereal and meadow or pasture crops which, for best results, should rotate in the order named.

Experiments have been conducted for the past eleven years to determine the relative value of different rotations. The results are distinctly in favour of the systematic rotation of crops whereby the soil is left in the best possible condition to receive the crop following.

The reasons why farmers should follow a rotation rather than continue the practice of haphazard cropping are many. The following are a few of the benefits resulting from crop rotation:—

1. The general appearance of a farm is improved where each crop is confined to one large area.
2. Every field receives at regular intervals its fair share of manure and cultural treatment, therefore the whole farm is in a condition to ensure maximum yields.
3. Cost is lessened by the saving of time due to all work of a kind being in one field.
4. Fewer fences are required, which reduces expenses.
5. Larger machinery can be utilized more economically where fields are larger and fewer.
6. More live stock can be kept, which makes more manure available.
7. Profits and yields are increased.
8. The farmer is not dependent upon a single crop.
9. It permits of the more even distribution of labour throughout the season.

The following rotations have been planned to meet the demands of the live stock farmer in Eastern Ontario and Quebec. Any of these should prove satisfactory where all operations, including soil treatment, are well performed. It is only when all factors are considered and each given its due share of attention that success will be attained.

ROTATION "A" (FIVE YEARS' DURATION).

First year.—Hoed crops. When corn is the hoed crop used, manure is applied in spring at the rate of 15 tons per acre and shallow ploughed shortly before planting time, turning under clover and manure. After the hoed crop is harvested, land is shallow ploughed or cultivated.

Second year.—Grain. Seeded down with 8 pounds of red clover, 2 pounds alsike and 10 pounds timothy per acre.

Third year.—Clover hay. Two crops expected. Top-dressed in fall with manure at rate of 15 tons per acre.

Fourth year.—Timothy hay. Field ploughed in August, top-worked and ribbed up in October.

Fifth year.—Grain. Seeded down with 10 pounds red clover, which is allowed to grow to be turned under following spring, when the hoed crop is corn.

This rotation supplies a relatively larger proportion of grain to roots and hay than the ordinary three- or four-year rotation; it would therefore be preferable where considerable grain is required. One-fifth of the land is in hoed crop, two-fifths in grain, one-fifth in clover hay, and one-fifth in timothy hay or pasture.

It has given good results here. Crop yields have been maintained and weeds have been kept in fair control.

ROTATION "B" (FIVE YEARS' DURATION).

First year.—Hoed crop. When corn is the hoed crop used, manure is applied in spring at rate of 15 tons per acre, and shallow ploughed shortly before planting time, turning under both clover and manure.

Second year.—Grain. Seeded down with 10 pounds of red clover, 2 pounds alsike and 5 pounds timothy per acre, manured at rate of 15 tons per acre.

Third year.—Hay. Ploughed late fall.

Fourth year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 5 pounds timothy per acre.

Fifth year.—Clover hay.

This rotation has maintained crop yields, and has given profits equal to "A" in the tests so far conducted, but does not answer requirements where timothy hay is called for. It can, however, be easily extended to include timothy by allowing of two years hay instead of one. This would extend the duration of the rotation from five to seven years, and the crops would succeed each other as follows: Hoed crop, grain, seeded down with clover and timothy; clover hay; timothy hay or pasture; grain, seeded down with clover and timothy; clover hay; timothy hay or pasture.

ROTATION "C" (FOUR YEARS' DURATION).

First year.—Hoed crop.

Second year.—Grain. Seeded down with 10 pounds red clover and 12 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Timothy hay. Field ploughed in August. Manured at rate of 24 tons per acre, worked at intervals and ridged up in late fall in preparation for hoed crops.

The only objection to this rotation is that it supplies a smaller proportion of grain than is often desired. However, where live stock is kept, this point is of minor importance. It has given satisfactory results here.

ROTATION "D" (THREE YEARS' DURATION).

First year.—Hoed crop. For corn, manure is applied in spring at rate of 18 tons per acre, and shallow ploughed shortly before corn planting time, turning under both clover and manure. For roots, land should be ploughed previous fall.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay.

This rotation is suitable where dairying or stock raising is carried on, and where there is considerable rough land for pasture. It is suitable for heavy rather than light soils.

ROTATION "R" (THREE YEARS' DURATION).

First year.—Corn. Manure applied in spring at rate of 18 tons per acre. Shallow ploughed shortly before corn planting time, turning under both clover and manure.

Second year.—Peas and oats mixed. Cut green for cattle. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay. Cut green for cattle.

Three years' records only have been kept. This rotation is designed to supply soiling crops.

The following is a summary of the characteristics common to all the rotations outlined above:—

1. Grain fields are always seeded down with clover, even though it be used only as a fertilizer, as in the case of the fifth year of rotation "A."

2. Grass and clover seedings are heavy. Increased crops of hay and rare failures of a catch have justified this practice.

3. Hoed crops form a large proportion of every rotation. An attempt to farm a small area without a hoed crop was not successful. Weeds could not readily be kept in check.

4. No field is left in hay for more than two successive years. Our records show that the second crop almost always costs more per ton than the first, and that succeeding crops are very liable to be grown at a loss.

5. Barnyard manure is applied frequently in comparatively small quantities, rather than at long intervals in large quantities.

To determine the net profits (profits after deducting cost of rent, all manual and horse labour, manure, seed, twine and use of machinery) as well as the value of yields of these rotations, careful records have been kept of all items chargeable against the rotations.

The following fixed values are being used in this and similar work on all the eastern farms and stations:—

COST VALUES.

Manual labour	$ 0 17 per hour.
Horse labour, including teamster—	
Single horse	27 "
2-horse team	34 "
3-horse team	41 "
4-horse team	48 "
Additional horses each	7 "
Rent	3 00 per acre.
Machinery (inclusive of threshing machinery)	60 "
Barnyard manure (spread)	1 00 per ton.
Commercial fertilizers charged at cost	
Seed wheat, oats, barley, buckwheat and rye	1 00 per acre.
Seed peas	2 00 "

Turnip, mangel, potato and corn seed charged at cost.

Grass and clover seed charged at cost, total cost to be distributed over the number of years in hay and pasture.

Twine charged at cost.

Threshing charged according to actual labour expended, the items charged under this head to include only such operations as begin after the load of grain arrives at the feed table, or after the grain is stacked or placed in the mow ready to be thrown on the feed table. Loading, hauling, etc., to be charged to manual and horse labour.

RETURN VALUES.

Wheat, oats, barley, rye and buckwheat		$ 0 01 per pound.
Peas		1¼ "
Hay (timothy, clover, alfalfa or mixed)		7 00 per ton.
Straw (wheat, oat, barley, rye, buckwheat or peas)		4 00 "
Corn ensilage		2 00 "
Sugar beets		3 00 "
Forage crops (green)		2 00 "
Turnips, carrots, mangels		2 00 "
Potatoes		50 per bushel.
Pasture—		
Horses	per head.	1 00 per month.
Cattle	"	1 00 "
Sheep	"	25 "

The items for which there are no fixed charges have been valued as follows:—

Twine	$ 0 13 per pound.
Red clover	20 00 per 100 lbs.
Alsike clover	21 00 "
Alfalfa	16 00 "
Timothy	8 50 "
Seed corn	1 50 per bushel.
Mangel seed	20 per pound.
Turnip seed	25 "

The returns for 1914 are low as compared with the average for preceding years. This was due largely to the season which, during the early part, was especially unfavourable to crops. These rotations were rearranged in 1912, and averages are therefore drawn for a period of eight years ending 1911.

Costs, Returns and Net Profits or Losses of Rotations "A," "B," "C," "D" and "R."

Rotation.	Cost to operate per acre.	Value of returns per acre.	Profits or losses per acre 1914.	Profit average of 8 years. 1904-11.
	$ c.	$ c.	$ c.	$ c.
A (five years' duration)	17 21	18 14	0 93	8 78
B " " ")	17 13	18 63	1 50	9 03
C (four " ")	16 83	15 62	−1 21	8 15
D (three ")	18 83	18 17	−0 66	10 08[1]
R (three ")	18 76	19 49	0 73	....

[1] Records kept for two years only.

The following tables contain details in

ROTATION "A"

Rotation year.	Crops. 1913.	Crops. 1914.	Area.	Items of Expense: Rent and Manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
			Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st...	Oats...........	Corn...........	1	9 40	1 87	42	7 14	1½	12½	5½	2½	......
2nd..	Hay...........	Oats...........	1	9 40	1 92	3	0 51	½	1½	5¼	1½	......
3rd...	Hay...........	Hay...........	1	9 40	2 04	6	1 02	½	2½	......	......	......
4th..	Oats...........	Hay...........	1	9 40	2 04	6	1 02	½	2½	......	......	......
5th..	Corn...........	Oats...........	1	9 40	1 86	3	0 51	½	1½	5¼	1½	......
	Aggregate......................		5	47 00	9 73	60	10 20	3½	20½	16	5½	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......
	ROTATION "B"											
1st...	Hay...........	Corn...........	1	9 00	1 87	38	6 46	1½	10½	5½	2½	......
2nd..	Corn...........	Oats...........	1	9 00	1 93	3	0 51	½	1½	5¼	1½	......
3rd..	Oats...........	Hay...........	1	9 00	3 45	6	1 02	½	2½	......	......	......
4th..	Hay...........	Oats...........	1	9 00	1 93	2½	0 43	½	2	5¼	1½	......
5th..	Oats...........	Hay...........	1	9 00	3 45	5	0 85	½	2½	......	......	......
	Aggregate......................		5	45 00	12 63	54½	9 27	3½	19	16	5½	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......
	ROTATION "C"											
1st...	Hay...........	Corn...........	1	9 00	1 87	41	6 97	1½	11½	5½	2½	......
2nd..	Corn...........	Oats...........	1	9 00	1 93	3	0 51	½	1½	5¼	1½	......
3rd..	Oats...........	Hay...........	1	9 00	2 11	5	0 85	½	2½	......	......	......
4th..	Hay...........	Hay...........	1	9 00	2 11	4½	0 77	½	2½	......	......	......
	Aggregate......................		4	36 00	8 02	53½	9 10	3	18	10¾	4	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......
	ROTATION "D"											
1st...	Hay...........	Corn...........	1	9 00	1 87	40	6 80	1½	11½	5½	2½	......
2nd..	Corn...........	Oats...........	1	9 00	1 93	2¼	0 39	½	1½	5¼	1½	......
3rd..	Oats...........	Hay...........	1	9 00	4 49	5	0 85	½	2½	......	......	......
	Aggregate......................		3	27 00	8 29	47¼	8 04	2½	15½	10¾	4	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......
	ROTATION "R"											
1st...	Hay...........	Corn...........	1·6	14 40	2 99	50	8 50	2½	15¼	8½	3¾	......
2nd..	Corn..........	Peas and oats..	1·6	14 40	3 41	20	3 40	2	10	6¼	2	......
3rd..	Peas and oats..	Hay...........	1·6	14 40	7 18	6½	1 11	1	4	......	......	......
	Aggregate......................		4·8	43 20	13 58	76½	13 01	5½	29¼	14¾	5¾	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......

OTTAWA.

connection with the rotations in 1914:—

(five years' duration).

in raising Crop.						Particulars of Crop.						
						Weight.						
Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Grain.	Straw.	Hay.	Roots, ensilage or green feed.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Lb.	Lb.	Lb.	Lb	$ c.	$ c.	$ c.
8 10	...	26 51	26 51	...	2 12	...	...	...	25,050	25 05	25 05	−1 46
3 52	1 13	16 48	16 48	24·9	...	2,252	1,918	...	...	26 36	26 36	9 88
0 99	...	13 45	13 45	...	10 67	...	...	2,530	...	8 86	8 86	−4 59
0 99	...	13 45	13 45	...	11 79	...	...	2,280	...	7 98	7 98	−5 47
3 52	0 88	16 17	16 17	[illegible]1·3	...	1,754	2,436	...	...	22 42	22 42	6 25
17 12	2 01	86 06	...	...	...	...	...	...	...	90 67	...	...
...	...	...	17 21	...	...	...	...	...	...	...	18 14	0 93

(five years' duration).

7 43	...	24 76	24 76	...	2 45	...	...	...	20,200	20 20	20 20	−4 56
3 52	1 06	16 02	16 02	25·6	...	2,126	1,544	...	...	24 35	24 35	8 33
0 99	...	14 46	14 46	...	6 34	...	...	4,560	...	15 96	15 96	1 50
3 69	1 08	16 13	16 13	25·5	...	2,150	1,720	...	...	24 94	24 94	8 81
0 99	0 10	14 29	14 29	...	12 99	...	...	2,200	...	7 70	7 70	−6 59
16 62	2 14	85 66	...	...	...	...	...	...	...	93 15	...	...
...	...	...	17 13	...	...	...	...	...	...	...	18 63	1 50

(four years' duration).

7 77	...	25 61	25 61	...	2 51	...	...	...	20,400	20 40	20 40	−5 21
3 52	0 92	15 88	15 88	29·3	...	1,840	2,280	...	...	22 96	22 96	7 08
0 99	...	12 95	12 95	...	9 05	...	...	2,860	...	10 01	10 01	−2 94
0 99	...	12 87	12 87	...	9 90	...	...	2,600	...	9 10	9 10	−3 77
13 27	0 92	67 31	...	...	...	...	...	...	...	62 47	...	...
...	...	...	16 83	...	...	...	...	...	...	...	15 62	−1 21

(three years duration).

7 77	...	25 44	25 44	...	2 54	...	...	...	20,000	20 00	20 00	−5 44
3 52	0 87	15 71	15 71	30·9	...	1,728	1,822	...	...	20 92	20 92	5 21
0 99	...	15 33	15 33	...	7 90	...	...	3,880	...	13 58	13 58	−1 75
12 28	0 87	56 48	...	...	...	...	...	...	...	54 50	...	...
...	...	...	18 83	...	...	...	...	...	...	...	18 17	−0 66

(three years' duration).

11 15	...	37 04	23 15	...	1 78	...	...	...	41,580	41 58	25 99	2 84
7 40	...	28 67	17 92	...	1 73	...	...	...	33,200	33 20	20 75	2 83
1 63	...	24 32	15 20	...	9 07	...	...	5,360	...	18 76	11 73	−3 47
20 24	...	90 03	...	...	...	...	...	...	...	93 54	...	...
...	...	...	18 76	...	...	...	...	...	...	...	19 49	0 73

Ottawa.

SHALLOW PLOUGHING AND SUBSOILING *versus* DEEP PLOUGHING.

This experiment has been under way for the past eleven years and the average returns for the period of ten years show a slight advantage in favour of the deep ploughing. The results of the experiment for the past season are also in favour of the deep ploughing. There must, however, be taken into consideration the fact that where subsoiling is practised, a single plough must be used whereas a two-furrow plough may be operated under the deep-ploughing method. The cost of operation is higher in the former method, which reduces somewhat the net profits.

Two four-year rotations differing only in the treatment of the sod land in preparation for corn or roots, were laid down in 1904.

ROTATION "S" (SHALLOW PLOUGHING AND SUBSOILING).

First year.—Corn or roots. Field manured at rate of 24 tons per acre. Ploughed out of sod previous August, 4 inches deep, subsoiled to a depth of 8 or 9 inches, and ridged up in late autumn. The land is ploughed shallow or cultivated in preparation for the grain which follows.

Second year.—Grain. Seeded down with 10 pounds red clover and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice in the season.

Fourth year.—Timothy hay. Broken in August and prepared for corn or roots, as indicated above.

ROTATION "P" (DEEP PLOUGHING).

This rotation differs from rotation "S" only in the treatment of the timothy hayfield in preparation for corn or roots. In August, it is manured, ploughed to a depth of 7 inches, top-worked and ploughed again late fall, 7 inches deep.

Costs, Returns and Net Profits of Rotations "S" and "P," 1914.

Rotation.	Cost to operate per acre.	Value of returns per acre.	Profit per acre. 1914
	$ c.	$ c.	$ c.
S (shallow ploughing and subsoiling)	17 96	20 33	2 37
P (deep ploughing)	17 36	21 12	3 76

Costs, Returns and Net Profits of Rotations "S" and "P," average of 11 years.

Year.	Cost to operate per acre.		Value of returns per acre.		Net profits per acre.	
	S	P	S	P	S	P
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
1904	19 89	19 89	22 98	22 98	3 09	3 00
1905	22 88	22 89	36 74	36 89	13 86	14 00
1906	19 35	19 39	25 06	24 93	5 71	5 54
1907	20 13	20 29	27 63	27 41	7 50	7 12
1908	15 84	16 03	20 21	20 34	4 37	4 31
1909	16 65	17 05	25 64	25 80	8 99	8 75
1910	13 67	14 42	23 36	23 60	9 69	9 18
1911	14 24	14 53	26 25	26 72	12 01	12 19
1912	19 47	19 02	27 14	28 99	7 67	9 97
1913	18 13	17 52	17 71	18 34	−0 42	0 82
1914	17 96	17 36	20 33	21 12	2 37	3 76
Total	198 21	198 39	273 05	277 12	74 84	78 73
Average for 11 years	18 02	18 03	24 82	25 19	6 80	7 16

OTTAWA.

The following table gives details of these rotations in 1914.

ROTATION "S"

Rotation Year.	Crops.		Area.	Items of Expense								
				Rent and manure.	Seed, twine and use of machinery.	Manual labour.		Horse labour (including teamster). Hours.				
						Hours.	Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
	1913.	1914.	Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st...	Hay...........	Corn...........	1	9 00	1 87	37	6 29	1½	29	1½	3½	......
2nd..	Corn..........	Oats...........	1	9 00	1 93	3	0 51	½	1½	5¼	1½	......
3rd..	Oats...........	Hay...........	1	9 00	2 11	5	0 85	1	3	......	......	......
4th..	Hay...........	Hay...........	1	9 00	2 11	5	0 85	½	2½	......	......	......
	Aggregate........................		4	36 00	8 02	50	8 50	3½	36	6¾	5	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......

ROTATION "P"

Rotation Year.	Crops.		Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st..	Hay..........	Corn...........	1	9 00	1 87	39	6 63	1½	12	9½	3	......
2nd..	Corn...........	Oats...........	1	9 00	1 93	3	0 51	½	1½	5¼	1½	......
3rd..	Oats...........	Hay...........	1	9 00	2 11	5	0 85	1	3	......	......	......
4th..	Hay...........	Hay...........	1	9 00	2 11	5	0 85	½	2½	......	......	......
	Aggregate......................		4	36 00	8 02	52	8 84	3½	19	14¾	4½	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......

Values as given on page 182 have been used:—

(shallow ploughing and subsoiling).

IN RAISING CROP.						PARTICULARS OF CROP.						
						Weight.						
Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Grain.	Straw.	Hay.	Roots, ensilage or green feed.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
12 56		29 72	29 72		2 16				27,450	27 45	27 45	−2 27
3 52	0 95	15 91	15 91	28·3		1,910	2,690			24 48	24 48	8 57
1 29		13 25	13 25		5 64			4,700		16 45	16 45	3 20
0 99		12 95	12 95		7 19			3,700		12 95	12 95	0 00
18 36	0 95	71 83								81 33		
			17 96								20 33	2 37

(deep ploughing).

Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Grain.	Straw.	Hay.	Roots, ensilage or green feed.	Total value.	Value of crop per acre.	Profit or loss per acre.
9 83		27 33	27 33		1 91				28,650	28 65	28 65	1 32
3 52	0 94	15 90	15 90	29		1,880	2,530			23 86	23 86	7 96
1 29		13 25	13 25		5 76			4,600		16 10	16 10	2 85
0 99		12 95	12 95		5 70			4,535		15 87	15 87	2 92
15 63	0 94	69 43								84 48		
			17 36								21 12	3 76

COMMERCIAL FERTILIZERS.

In 1914 there were completed six years of experiments designed to supply information concerning the relative fertilizing merits, in regular farm rotation, of:—

(1) No manure or fertilizer of any kind, but pastured one year in four (records kept for two years only).

(2) Barnyard manure.

(3) Complete commercial fertilizer.

(4) Barnyard manure, together with commercial fertilizer.

To carry out this work, four areas of land were selected, "N" in 1912, and "X," "Y" and "Z" in 1909. Each area was divided into four equal-sized plots, and placed under the following rotation:—

First year.—Hoed crop.

Second year.—Oats. Seeded down with 8 pounds red clover, 2 pounds alsike, and 12 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Timothy hay on rotations "X," "Y" and "Z," and pasture on rotation "N." Land ploughed shallow in early autumn, top-worked and ribbed up in late autumn.

The fertilizer treatment given these areas is shown in the following table:—

FERTILIZER Treatment Given Rotations "N," "X," "Y" and "Z."

Crop.	Rotation N.	Rotation X.	Rotation Y.	Rotation Z.
Mangels	No fertilizer	Manure 15 tons	No Manure. Superphosphate 300 lb. Muriate of Potash, 75 lb. Nitrate of Soda, 100 lb.	Manure 7½ tons. Superphosphate 150 lb. Muriate of Potash, 37½ lb. Nitrate of Soda, 50 lb.
Oats	No fertilizer	No fertilizer	Nitrate of Soda, 100 lb.	Nitrate of Soda, 100 lb.
Clover hay	No fertilizer	No fertilizer	Nitrate of Soda. 100 lb.	Nitrate of Soda, 100 lb.
Timothy hay	Pastured	No fertilizer	Nitrate of Soda. 100 lb.	Nitrate of soda, 100 lb.

The six years' results supply the following interesting data:—

Rotation "X," which was fertilized with barnyard manure alone, cost the least to operate and produced the largest returns. The average profit for the period was $7.46 per acre.

Rotation "Z," which received a mixture of barnyard manure and commercial fertilizers, produced equally as well as rotation "X," but cost slightly more to operate, with the result that the net profit was just $6.52 per acre.

Rotation "Y," receiving commercial fertilizer alone, was the lowest in producing power and cost as much to operate as "X." The profits therefrom have averaged only $5.38 per acre.

These results show a distinct advantage of barnyard manure alone over commercial fertilizer alone for this soil, but point to the possibility of combining the two to good advantage when barnyard manure is scarce or high in price.

OTTAWA.

In calculating the returns from these rotations, fixed values as given on page 182 of this report were used. Fertilizers were valued as follows:—

Muriate of potash	\$2.50 per 100 pounds.
Nitrate of soda	3.00 " "
Superphosphate	0.90 " "

Costs, Returns and Profits per acre of Rotations "N," "X," "Y" and "Z."

Rotation.	Cost to operate.	Value of returns.	Net profit 1914.	Net profit average of 6 years.
	\$ c.	\$ c.	\$ c.	\$ c.
N—No manure or fertilizer of any kind	11 59	13 41	1 82	1 47[1]
X—Barnyard manure	16 01	21 38	5 37	7 46
Y—Complete commercial fertilizer	16 04	23 53	4 49	5 38
Z—Barnyard manure together with commercial fertilizer	17 21	22 45	5 24	6 52

[1]Average two years, only.

COSTS, Returns and Profits per acre of Rotations "X," "Y" and "Z," 1909-14.

Year.	Cost to operate per acre.			Value of returns per acre.			Profit per acre.		
	X	Y	Z	X	Y	Z	X	Y	Z
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
1909	13 15	15 42	14 51	19 72	20 70	20 82	6 57	5 28	6 31
1910	26 58	29 16	27 91	32 55	34 52	36 26	5 97	5 36	8 35
1911	14 86	16 70	16 16	24 90	22 84	26 88	10 04	6 14	10 72
1912	19 23	19 39	20 24	30 44	26 95	25 38	11 21	7 56	5 14
1913	16 47	16 65	17 81	22 09	20 07	21 16	5 62	3 42	3 35
1914	17 72	18 89	18 97	25 18	24 27	25 49	7 46	5 38	6 52
Total for 6 years	108 01	116 21	115 60	154 88	149 35	155 99	46 87	33 14	40 39
Average per acre for 6 years	18 00	19 37	19 27	25 81	24 89	26 00	7 81	5 52	6 73

YIELDS of Hoed Crops on Rotations "X," "Y" and "Z," 1909-14.

Year.	Area.	RotationX.	Rotation Y.	Rotation Z.
	Acres.	Lb.	Lb.	Lb.
1909	1	26,540	28,290	26,445
1910	2	73,520	78,276	81,290
1911	1	28,160	22,730	29,970
1912	1	48.360	49,130	48, 60
1913	1	36,000	32,480	34,418
1914	1	32,360	33,090	37,160
Total yield 6 year		244 940	243,99	257,643
Average per acre for 6 years		17 tons 991 lb.	17 tons6 857 b.	8 tons 806 lb.

YIELDS of Oats on Rotations "X," "Y" and "Z," 1909-14.

Year.	Area.	Rotation X.		Rotation Y.		Rotation Z.	
		Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
	Acres.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1909	1	1,455	2,725	1,615	2,735	1,576	2,789
1910 [1]	....	....	....	....	....	....	....
1911	1	1,474	2,436	1,709	2,530	1,893	2,777
1912	1	2,492	3,238	1,421	1,90[illegible]	1,035	1,945
1913	1	1,650	1,680	1,457	1,363	1,565	1,735
1914	1	1,700	1,760	1,200	1,300	1,100	1,220
Total yield for 5 years		8,771	11,839	7,402	9,837	7,169	10,466
Average per acre for 5 years		51 bush. 20 lb.	2,368 lb.	43 bush. 18 lb.	1,967 lb.	42 bush. 6 lb.	2,093 lb.

[1] Hoed crops grown in place of grain in 1910.

YIELDS of Hay on Rotations "X," "Y" and "Z," 1909-14.

Year.	Area.	Rotation X.	Rotation Y.	Rotation Z.
	Acres.	Lb.	Lb.	Lb.
1909	2	[illegible],240	9,405	10,157
1910	2	6,909	7,230	7,860
1911	2	14,810	13,280	15,160
1912	2	12,000	11,610	11,120
1913	2	9,290	8,710	8,890
1914	2	9,325	9,830	11,200
Total yield for 6 years		61,565	60,065	64,387
Average per acre for 6 years		2 tons 1,130 lb.	2 tons 1,005 lb.	2 tons 1,366 lb.

FERTILIZER

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
			Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st...	Pasture........	Mangels........	0·33	1 00	0 70	22	3 74	1¼	5	1¼	1¼	......
2nd..	Mangels........	Oats...........	0·33	1 00	0 61	1	0 17	¼	½	1¾	¼	......
3rd..	Oats...........	Hay...........	0·33	1 00	0 66	1¾	0 27	¼	1	......	......	......
4th..	Hay...........	Hay...........	0·33	1 00	0 46	......	......	......	......	......	......	......
	Aggregate......................		1·32	4 00	2 43	24¾	4 18	1¾	6½	3	1½	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......

FERTILIZER

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st...	Hay...........	Turnips........	1	6 75	1 10	68	11 56	4	14½	4	4	......
2nd..	Mangels........	Oats...........	1	6 75	1 93	2¾	0 47	½	1½	5¼	1	......
3rd..	Oats...........	Hay...........	1	6 75	2 12	5	0 85	½	3	......	......	......
4th..	Hay...........	Hay...........	1	6 75	2 12	5	0 85	½	3	......	......	......
	Aggregate......................		4	27 00	7 27	80¾	13 73	5½	22	9¼	5	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......

FERTILIZER

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st...	Hay...........	Turnips........	1	7 14	1 10	69½	11·82	4	9½	4	4	......
2nd..	Mangels........	Oats...........	1	7 14	1 93	4¼	0 72	½	1½	5¼	1	......
3rd..	Oats...........	Hay...........	1·	7 14	2 12	5	0 85	½	3	......	......	......
4th..	Hay...........	Hay...........	1	7 14	2 12	5	0 85	½	3	......	......	......
	Aggregate......................		4	28 56	7 27	83¾	14 24	5½	17	9¼	5	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......

FERTILIZER

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st...	Hay...........	Turnips........	1	8 07	1 10	70	11 90	4	12½	4	4	......
2nd..	Mangels........	Oats...........	1	8 07	1 93	2¾	0 47	½	1½	5¼	1	......
3rd..	Oats...........	Hay...........	1	8 07	2 12	6½	1 11	½	3	......	......	......
4th..	Hay...........	Hay...........	1	8 07	2 12	5½	0 94	½	2½	......	......	......
	Aggregate......................		4	32 28	7 27	84¾	14 42	5½	19½	9¼	5	......
	Average per acre, 1914..........		......	......	......	......	......	......	......	......	......	......

ROTATION "N."

...in raising Crop.						Particulars of Crop.						
						Weight.						
Cost of horse labour	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Grain.	Straw.	Hay.	Roots, ensilage and green feed.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Lb.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.
3 15	.....	8 59	25 77	.....	.....	.....	.....	.....	6,770	6 77	20 31	−5 46
1 08	0 20	3 06	9 18	.....	.....	408	512	.....	.....	5 10	15 30	6 12
0 41	.....	2 34	7 02	.....	.....	.....	.....	1,240	.....	4 34	13 02	6 00
.....	.....	1 46	4 38	.....	.....	.....	.....	.....	.....	1 67	5 01	0 63
4 64	.....	15 45	46 35	.....	.....	.....	.....	.....	.....	17 88	53 64	.....
.....	.....	.....	11 59	.....	.....	.....	.....	.....	.....	.....	13 41	1 82

ROTATION "X."

9 57	.....	28 98	28 98	.....	.....	.....	.....	.....	32,360	32 36	32 36	3 38
3 28	0 85	13 28	13 28	.....	.....	1,700	1,760	.....	.....	20 52	20 52	7 24
1 16	.....	10 88	10 88	.....	.....	.....	.....	5,225	.....	18 29	18 29	7 41
1 16	.....	10 88	10 88	.....	.....	.....	.....	4,100	.....	14 35	14 35	3 47
15 17	.....	64 02	.....	.....	.....	.....	.....	.....	.....	85 52	.....	.....
.....	.....	.....	16 01	.....	.....	.....	.....	.....	.....	.....	21 38	5 37

ROTATION "Y."

7 87	.....	27 93	27 93	.....	.....	.....	.....	.....	33,090	33 09	33 09	5 16
3 28	0 60	13 67	13 67	.....	.....	1,200	1,300	.....	.....	14 60	14 60	0 93
1 16	.....	11 27	11 27	.....	.....	.....	.....	5,610	.....	19 64	19 64	8 37
1 16	.....	11 27	11 27	.....	.....	.....	.....	4,220	.....	14 77	14 77	3 50
13 47	0 60	64 14	.....	.....	.....	.....	.....	.....	.....	82 10	.....	.....
.....	.....	.....	16 04	.....	.....	.....	.....	.....	.....	.....	20 53	4 49

ROTATION "Z."

8 89	.....	29 96	29 96	.....	.....	.....	.....	.....	37,160	37 16	37 16	7 20
3 28	0 55	14 33	14 33	.....	.....	1,100	1,220	.....	.....	13 44	13 44	−0 86
1 16	.....	12 46	12 46	.....	.....	.....	.....	6,225	.....	21 79	21 79	9 33
0 99	.....	12 12	12 12	.....	.....	.....	.....	4,975	.....	17 41	17 41	5 29
14 32	0 55	68 84	.....	.....	.....	.....	.....	.....	.....	89 80	.....	.....
.....	.....	.....	17 21	.....	.....	.....	.....	.....	.....	.....	22 45	5 24

EXPERIMENTAL STATION FOR PRINCE EDWARD ISLAND, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

SEASONAL NOTES.

Snow lay on the ground during the greater part of the winter of 1913-14, and in February there was a period of extremely cold weather. The spring was very late, due to a heavy snowfall on May 2 and a light one on May 11, which delayed seeding until May 18. The trees appeared green May 28. In June rain fell on seventeen days, and the nights were cool, hoar frost being reported in some parts of the province on July 1. At this Station, haying began July 15, and the first grain was cut August 20, which was probably one week before either operation became general in the province. Two periods of hot weather occurred in September, when the temperature exceeded any former records of the summer. During these hot waves the harvest was safely housed.

Some Weather Observations taken at Charlottetown Experimental Station, 1914.

Month.	Temperature F.			Precipitation.			Heaviest in 24 hours.	Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.		
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	45	−6	16·314	·73	32	3·93	1·1	79·6
February	43	−21	9·82	·08	35·5	3·63	1·9	138·3
March	44	8	28·95	1·84	15·75	3·42	1·09	128·5
April	56	8	32·66	1·33	24·5	3·78	·8	194·9
May	76	26	48·548	1·2	8·5	2·05	·64	191·4
June	79	34·5	54·741	5·32	....	5·32	2·02	247·7
July	82	37	63·201	2·84	....	2·84	·93	277·9
August	84	46	64·	2 43	....	2·43	·55	247·9
September	8	35	59·016	5·02	....	5·02	1·47	191·
October	72	26	47·823	3·57	....	3·57	·96	135·9
November	59	11	35·284	2·29	3·6	2·65	·48	96·5
December	50	−10	22·709	1·1	9·2	2·02	·38	99·9
Total for year				27·75	129·05	41·56	....	2,029·5
Average for six years				32·25	105·68	42·77	....	1,907·5
Total for six growing months, April to September				18·14	23·	21·44	....	1,350·8
Average of five years for six growing months, April to September				17·85	12·1	19·05	....	1,302·

FIELD CROP YIELDS.

The season of 1914 was favourable for grain crops and the yields included in the statement which follows are above the average of production. The grains mentioned in connection with certain rotations were grown on multiplying plots from registered grain for seed purposes.

Field Crop Areas and Yields, Charlottetown, 1914.

Crop.	Preceding Crop.	Acreage.	Total Yield.	Yield per acre.
Wheat, Marquis	Turnips (Rotation B)	1·	28 bush. 25 lb.	28 bush. 25 lb.
" "	" (Rotation F)	·86	16 " 9 "	18 " 47 "
" Red Fife	Potatoes (Rotation D)	1·	14 " 12 "	14 " 12 "
Oats, Banner	Mangels (Rotation A)	1·	83 " 27 "	83 " 27 "
" "	Clover Hay (Rotation B)	1·	50 " 10 "	5 " 10 "
" "	Oats, (Connolly Field)	8·	282 " 4 "	35 " 9 "
" Ligowo	Corn (Rotation G)	·4	26 " 17 "	66 " 8 "
" Daubeney	Hay (Rotation G)	·4	19 " 1 "	47 " 19 "
" O. I. Black	Corn (Rotation C)	·57	36 " 16 "	63 " 33 "
" Victory	Pasture (Haszard Field)	3·	107 " 28 "	35 " 32 "
Barley, Manchurian	Hay (Rotation A)	1·	50 " 2 "	50 " 2 "
" Gold	" (Rotation F)	·86	49 " 12 "	57 " 13 "
Potatoes	Clover Hay (Rotation D)	1·	210 " 53 "	210 " 53 "
"	Oats (Rotation G)	·4	110 " 40 "	276 " 40 "
"	Hay (Rotation C)	·57	116 " -- "	203 " 30 "
Turnips	Clover Hay (Rotation B)	1·	21 tons 180 lb.	21 tons 180 lb.
"	Barley (Rotation F)	·86	19 " 315 "	22 " 522 "
Mangels	" (Rotation A)	1·	23 " 680 "	23 " 680 "
Hay	Oats (Rotation A)	1·	2 " 1,260 "	2 " 1,260 "
"	Hay (Rotation A)	1·	2 " 410 "	2 " 410 "
"	Wheat (Rotation B)	1·	1 " 1,660 "	1 " 1,660 "
"	Oats (Rotation B)	1·	– " 1,950 "	– " 1,950 "
"	Wheat (Rotation D)	1·	2 " 300 "	2 " 300 "
"	Oats (Rotation C)	·57	1 " 1,390 "	2 " 1,947 "
"	" (Rotation G)	·4	1 " 345 "	2 " 1,862 "
"	Wheat (Rotation F)	·86	1 " 205 "	1 " 564 "

Charlottetown.

COST OF PRODUCTION OF FIELD CROPS.

The following data on the cost of production of the various crops are taken from the records kept in connection with the crop rotation experiments. As previously reported, this land is not uniform, and the areas are small, so that it will require averages extending over a number of years to make the data valuable.

The values are those that have been fixed for the rotation work on all the eastern Experimental Stations. They are not always exactly in accord with this year's prices, but on the whole they accord with normal eastern conditions. These values are given on page 182 of this report.

Cost of Production of Wheat Following Turnips.

Number of acres, 1.

Preceding crops: (Rotation B) hay, oats, hay, turnips.

Rent of land at $3 per acre	$3 00
Share of manure, at rate of 22½ tons per acre, at $1 per ton	4 50
Use of machinery at 60 cents per acre	60
Seed, 1¾ bushels	1 00
Twine, 2·7 pounds at 12 cents per pound	32
Ploughing in autumn, 2½ hours, 2-horse team at 34 cents	85
Discing in spring, 1½ hours, 2-horse team at 34 cents	51
Harrowing, ½ hour, 2-horse team at 34 cents	17
Rolling, ¼ hour, 2-horse team at 34 cents	9
Sowing, ¾ hour, 2-horse team at 34 cents	25
Cutting with binder, ¾ hour, 2-horse team at 34 cents	25
Stooking, 1½ hours manual labour at 17 cents	25
Loading and unloading, 1½ hours manual labour at 17 cents	25
Hauling, 1 hour, 2-horse team at 34 cents	34
Storing, ½ hour manual labour at 17 cents	9
Threshing, 2⅔ hours manual labour at 17 cents	45
Cost per acre	$12 92

Yield of grain per acre, 1,705 pounds or 28 bushels 25 pounds.
Yield of straw per acre, 2,600 pounds or 1 ton 600 pounds.
Valuing the straw at $4 per ton, the cost to produce 1 bushel of grain was 27·1 cents.

Cost of Production of Barley after Hay.

Number of acres, 1.

Preceding crops: (Rotation A) oats, mangels, hay, hay.

Rent of land at $3 per acre	$ 3 00
Share of manure, at rate of 25 tons per acre, at $1 per ton	5 00
Use of machinery at 60 cents per acre	60
Seed, 2 bushels	1 00
Twine, 2 pounds at 12 cents per pound	24
Ploughing in autumn, 2½ hours, 3-horse team at 41 cents	1 03
Harrowing in autumn, 1¾ hours, 3-horse team at 41 cents	71
Discing in spring, 4½ hours, 2-horse team at 34 cents	1 53
Harrowing, 1 hour, 2-horse team at 34 cents	34
Rolling, ¼ hour, 2-horse team at 34 cents	8
Sowing, ¾ hour, 2-horse team at 34 cents	25
Cutting with binder, ¾ hour, 2-horse team at 34 cents	25
Stooking, 2 hours manual labour at 17 cents	34
Loading and unloading, 2 hours manual labour at 17 cents	34
Hauling, 1 hour, 2-horse team at 34 cents	34
Threshing, 4 hours manual labour at 17 cents	68
Cost per acre	$15 73

Yield of grain per acre, 2,402 pounds or 50 bushels 2 pounds.
Yield of straw per acre, 1,878 pounds.
Valuing the straw at $4 per ton, the cost to produce 1 bushel of grain was 24 cents.

CHARLOTTETOWN.

Cost of Production of Oats following Mangels.

Number of acres, 1.
Preceding crops: (Rotation A) hay, hay, barley, mangels.

Rent of land at $3 per acre	$ 3 00
Share of manure, at rate of 25 tons per acre, at $1 per ton	5 00
Use of machinery at 60 cents per acre	60
Seed, 2½ bushels	1 00
Twine, 3·2 pounds at 12 cents per pound	38
Ploughing in autumn, 2½ hours, 2-horse team at 34 cents	85
Discing in spring, 3¼ hours, 2-horse team at 34 cents	1 13
Harrowing, ¾ hours, 2-horse team at 34 cents	24
Rolling, ¼ hour, 2-horse team at 34 cents	8
Sowing, ¾ hour, 2-horse team at 34 cents	25
Cutting with binder, ¾ hour, 2-horse team at 34 cents	25
Stooking, 1½ hours manual labour at 17 cents	25
Loading and unloading, 1 hour manual labour at 17 cents	17
Hauling, 1¼ hours, 2-horse team at 34 cents	43
Threshing, 5 hours manual labour at 17 cents	85
Cost per acre	$14 48

Yield of grain per acre, 2,849 pounds or 83 bushels, 27 pounds.
Yield of straw per acre, 3,865 pounds or 1 ton, 1,865 pounds.
Valuing the straw at $4 per ton, the cost to produce 1 bushel of grain was 8 cents.

Cost of Production of Mangels after Barley.

Number of acres, 1.
Preceding crops: (Rotation A) oats, hay, hay, barley.

Rent of land at $3 per acre	$ 3 00
Share of manure, at rate of 25 tons per acre, at $1 per ton	5 00
Use of machinery at 60 cents per acre	60
Seed, 3 pounds at 50 cents per pound	1 50
Ploughing in autumn, 2 hours, 3-horse team at 41 cents	82
Discing in spring, 3½ hours, 2-horse team at 34 cents	1 19
Harrowing, 2 hours, 2-horse team at 34 cents	68
Rolling twice, ½ hour, 2-horse team at 34 cents	17
Ridging, 1½ hours, 2-horse team at 34 cents	51
Sowing, 2 hours manual labour at 17 cents	34
Singling and hoeing, 265 hours manual labour at 17 cents	45 05
Cultivating, 12 hours, 1-horse team at 27 cents	3 24
Pulling, topping, loading, 39 hours manual labour at 17 cents	6 63
Hauling, 10 hours, 3-horse team at 41 cents	4 10
Storing, 13 hours manual labour at 17 cents	2 21
Cost per acre	$75 04

Yield of roots per acre, 23 tons, 680 pounds or 778 bushels.
Cost to produce 1 ton, $3.22.
Cost to produce 1 bushel, 9·6 cents.

Cost of Production of Turnips after Hay.

Number of acres, 1.
Preceding crops: (Rotation B) wheat, hay, oats, hay.

Rent of land at $3 per acre	$ 3 00
Share of manure at rate of 22½ tons per acre, at $1 per ton	4 50
Use of machinery at 60 cents per acre	60
Seed, 2 pounds at 35 cents per pound	70
Ploughing in autumn, 2½ hours, 3-horse team at 41 cents	1 02
Harrowing in autumn, 1¼ hours, 3-horse team at 41 cents	51
Discing in spring, 3 hours, 2-horse team at 34 cents	1 02
Harrowing, 1 hour, 2-horse team at 34 cents	34
Rolling twice, ½ hour, 2-horse team at 34 cents	17
Ridging, 1⅓ hours, 2-horse team at 34 cents	45
Sowing, ½ hour manual labour at 17 cents	8
Singling and hoeing, 91 hours manual labour at 17 cents	15 44
Cultivating, 1-horse team at 27 cents	2 43
Pulling, topping, loading, 32 hours manual labour at 17 cents	5 44
Hauling, 12 hours, 3-horse team at 41 cents	4 92
Storing, 11 hours manual labour at 17 cents	1 87
Cost per acre	$42 52

Yield of roots per acre, 21 tons, 180 pounds or 703 bushels.
Cost to produce 1 ton, $2.01.
Cost to produce 1 bushel, 6 cents.

CHARLOTTETOWN.

Cost of Production of Potatoes after Clover Hay.

Number of acres, 1.
Preceding crops: (Rotation D) wheat, hay.

Rent of land at $3 per acre	$ 3 00
Share of manure at rate of 17⅓ tons per acre, at $1 per ton	5 77
Use of machinery at 60 cents per acre	60
Seed, 12 bushels at 50 cents per bushel	6 00
Ploughing in autumn, 3 hours, 2-horse team at 34 cents	1 02
Harrowing in autumn, 2 hours, 2-horse team at 34 cents	68
Discing in spring, 1¾ hours, 2-horse team at 34 cents	59
Harrowing, 1 hour, 2-horse team at 34 cents	34
Rolling, ⅓ hour, 2-horse team at 34 cents	12
Cutting sets, 12 hours manual labour at 17 cents	2 04
Planting, 2 hours, 2-horse team at 34 cents	68
Planting, 3 hours, manual labour at 17 cents	51
Spraying, ½ hour, 2-horse team at 34 cents	17
Hoeing, 12 hours manual labour at 17 cents	2 04
Cultivating, 6 hours, 1-horse team at 27 cents	1 62
Spray, 3 times (Bordeaux and Paris Green)	1 71
Cultivating, 3 hours, 2-horse team at 34 cents	1 02
Picking potatoes, 43 hours manual labour at 17 cents	7 31
Digging potatoes, 2 hours, 2-horse team at 34 cents	68
Hauling, 5 hours, 3-horse team at 41 cents	2 05
Storing, 20 hours manual labour at 17 cents	3 40
Cost per acre	$41 35

Yield of potatoes per acre, 6 tons, 653 pounds or 210 bushels 53 pounds.
Cost to produce 1 ton, $6.54.
Cost to produce 1 bushel, 19·6 cents.

Cost of Production of Hay after Wheat.

Number of acres: 1.
Preceding crops: (Rotation D) potatoes, wheat.

Rent of land at $3 per acre	$ 3 00
Share of manure, at rate of 17⅓ tons per acre at $1 per ton	5 77
Use of machinery at 60 cents per acre	0 60
Charges on 12 pounds of timothy at 9 cents, 8 pounds red clover at 28¼ cents, 2 pounds alsike at 32 cents	3 98
Cutting ·8 hour with 2-horse team at 34 cents	0 27
Coiling and tedding, 10½ hours manual labour at 17 cents	1 78
Raking, ¼ hour with 2-horse team at 34 cents	0 09
Loading, ½ hour with 2-horse team at 34 cents and 3 hours manual labour at 17 cents	0 6
Unloading, ¼ hour with 2-horse team at 34 cents and 1 hour manual labour at 17 cents	0 26
Cost per acre	$16 43

Yield of hay per acre 2 tons, 300 pounds.
Cost to produce 1 ton, $7.64.

Cost of Production of Hay after Oats.

Number of acres: 1.
Preceding crops: (Rotation A) hay, barley, mangels, oats.

Rent of land at $3 per acre	$ 3 00
Share of manure at rate of 25 tons per acre, at $1 per ton	5 00
Use of machinery at 60 cents per acre	0 60
Half of the charges on 12 pounds of timothy at 9 cents, 10 pounds red clover at 28 cents, 2 pounds alsike at 32 cents	2 26
Cutting, five-sixth hour with 2-horse team at 34 cents	0 28
Coiling and shaking out, 9 hours manual labour at 17 cents	1 53
Raking, ¼ hour with 2-horse team at 34 cents	0 09
Loading, ¾ hour with 2-horse team at 34 cents and 2½ hours manual labour at 17 cents	0 66
Unloading, ¼ hour with 2-horse team at 34 cents and 1 hour manual labour	0 26
Cost per acre	$13 68

Yield of hay per acre, 2 tons, 1,260 pounds.
Cost to produce 1 ton, $5.20.

The following table gives a summary of the cost of production of wheat, oats, barley, mangels, turnips, potatoes and hay. In computing the values of the cereals the straw was valued at $4 per ton. The very high cost of the mangels per acre was due to the large amount of hand labour required to clean the land thoroughly of couch grass and other weeds with which it was infested.

Cost of Production of Field Crops, Charlottetown, P.E.I., 1914.

Crop.	Area.	Yield per acre.				Cost to Produce.		
						Per acre.	Per ton.	Per bush.
	Acres.	Tons.	Lb.	Bush.	Lb.	$ cts.	$ cts.	Cents.
Wheat	1			28	25	12 92		27·1
Oats	1			83	27	14 48		8
Barley	1			50	2	15 73		24
Mangels	1	23	680	778		75 04	3 22	9·6
Turnips	1	21	180	703		42 52	2 01	6
Potatoes	1	6	653	201	53	41 35	6 54	19·6
Hay after wheat	1	2	300			16·43	7·64	
Hay after oats	1	2	160			13 68	5·20	

ROTATION OF CROPS.

It is generally known that certain crops do better after certain other crops, but it is very important that a systematic rotation be adopted for the following reasons:—

(A) A variety of food can be provided for stock at the different seasons of the year.

(B) Noxious weeds may be controlled or eradicated from the land cheaply.

(C) Certain rotations aid in the control of plant diseases.

(D) A definite farm plan eliminates all unnecessary fences.

The following rotations, which were started in 1912, meet a number of the requirements in Prince Edward Island:—

ROTATION "A" (FIVE YEARS' DURATION).

Suitable for Dairy Farm.

First year.—Hoed crop. On a dairy farm, mangels can be grown to advantage. Part of the manure, about 12 tons per acre, can be applied either before or after the previous grain crop. Then 13 tons of manure per acre is worked into the land before it is ridged up for the mangels. After the crop is harvested the land is ridged up for the winter.

Second year.—Grain. Seeded down with 10 pounds of red clover, 2 pounds of alsike and 12 pounds of timothy per acre.

Third year.—Clover hay. After the rotation is well started the clover does not winter-kill nearly as badly as when it was sown on land that had been in hay for several years.

Fourth year.—Timothy hay or pasture. There was quite a good sprinkling of clover in this field in 1914. It was ploughed in August and top-worked during autumn.

Fifth year.—Grain. Barley has been used as this grain crop, and 8 pounds of red clover was sown with it. This not only added much valuable fertilizer to the land, but it no doubt assisted in propagating and conserving the necessary clover bacteria in the soil until the next clover crop of the rotation.

This rotation provides a large supply of roots and grain, which are essential for good live stock production. Sufficient grain can be raised so that part of it can be sold for seed purposes and concentrated meals bought at feed prices for the stock.

ROTATION "B" (FIVE YEARS' DURATION).

Similar to "A" in regard to crops grown, but devised to destroy ox-eye daisy and other persistent weeds.

First year.—Hoed crop. Turnips have been used, and produce a large quantity of succulent winter food. Spring manured at rate of 15 tons per acre.

Second year.—Grain. Seeded down with 10 pounds of red clover, 2 pounds alsike, and 6 pounds timothy per acre.

Third year.—Clover hay. Ploughed in autumn.

Fourth year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike, and 12 pounds timothy per acre, and ploughed under for roots.

This rotation produces a large quantity of clover hay and destroys weeds, with a small expenditure of labour. It can easily be extended another year or two so as to provide timothy hay or pasture.

ROTATION "C" (FOUR YEARS' DURATION).

Suitable for stock farms where quantities of hay are needed and only a sufficient quantity of grain is required for feeding purposes.

First year.—Hoed crops. Manured 20 tons per acre, part applied previous autumn.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Timothy hay or pasture. Clover came well on parts of the field. A part of the manure for the roots was applied and ploughed under early in September.

ROTATION "D" (THREE YEARS' DURATION).

This rotation will supply the greatest quantity of rough forage and grain for dairy or beef cattle. It is probably the best rotation to destroy many of our worst weeds, and for this reason it could be used advantageously for a period of years on sections of the farm that have become infested with daisy, yarrow or couch grass. Pasturage for stock has to be supplied elsewhere, which does not suit Prince Edward Island conditions owing to the lack of rough pasture land, the province being almost wholly tillable.

First year.—Hoed crop. Manured 15 tons per acre.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds of timothy.

Third year.—Clover hay. Cut before the weed seeds ripen and aftermath ploughed under early in the fall and top-worked in preparation for the hoed crop.

CHARLOTTETOWN.

ROTATION "F" (FOUR YEARS' DURATION).

This rotation was planned to meet a special need; the growing of large quantities of grain for seed purposes. The area for cereals at this Station is limited; the arrangement for this rotation was made in order to test as many varieties of grain in duplicate as possible, one-half of the total area being in grain each year. It has also been a good weed destroyer.

First year.—Hoed crop. Manured 12 tons per acre, worked in in spring.

Second year.—Grain. Wheat or barley seeded down with 10 pounds of red clover. 2 pounds of alsike and 6 pounds of timothy.

Third year.—Clover hay. Top-dressed with 8 tons manure and ploughed under in autumn.

Fourth year.—Oats. Seeded down with 8 pounds of red clover and 2 pounds of alsike.

ROTATION "G" (SEVEN YEARS' DURATION).

This is known as the "Prince Edward Island rotation," and is still most generally used in the province. It is used here to demonstrate that with four consecutive years of hay or pasture, clover does not thrive as well or persist under adverse winter conditions such as have been general for some years.

It is believed to be efficient in controlling plant diseases such as club-root of turnips and powdery scab of potatoes.

First year.—Oats. Seeded down with 8 pounds of red clover and 2 pounds of alsike.

Second year.—Hoed crops. Potatoes on the greater part of the area. Manured with twenty tons of manure.

Third year.—Wheat or barley. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds of timothy per acre.

Fourth year.—Hay.

Fifth year.—Hay. Top-dressed in August with 15 tons manure.

Sixth year.—Pasture.

Seventh year.—Pasture. Ploughed in August and top-worked during autumn.

We have not been able to pasture this rotation and as the meadows are only two years old, the whole area having been drained in the autumn of 1912, the hay on all the sections was heavy. This rotation will be a good one to check the others up with in future.

Fixed cost and return values given on page 182 of this report are being used.

ROTATION "A"

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
			Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
3rd..	Oats...........	Hay...........	1	8 00	2 86	$12\frac{1}{2}$	2 12	......	$2\frac{1}{12}$	......	......	......
4th..	Hay...........	Hay...........	1	8 00	3 36	12	2 04	......	$1\frac{1}{3}$	......	......	......
5th..	Hay...........	Barley.........	1	8 00	1 84	4	68	......	$8\frac{1}{4}$	$4\frac{1}{4}$	......	......
1st...	Barley.........	Mangels........	1	8 00	2 10	319	54 23	12	$7\frac{1}{2}$	12	......	......
2nd..	Mangels........	Oats...........	1	8 00	1 98	$2\frac{1}{2}$	42	......	$9\frac{1}{2}$	......	......	......
	Aggregate......................		5	40 00	12 14	350	59 49	12	$28\frac{2}{3}$	$16\frac{1}{4}$	......	......
	Average per acre..............		......	8 00	2 43	70	11·89	2·4	5·7	3·2	......	......
	ROTATION "B"											
3rd..	Wheat..........	Hay...........	1	7 50	5 12	12	2 04	......	$1\frac{5}{6}$	......	......	......
4th..	Hay...........	Oats...........	1	7 50	1 96	$3\frac{1}{2}$	59	......	6	$5\frac{2}{3}$	......	......
5th..	Oats...........	Hay...........	1	7 50	4 58	6	1 02	......	$1\frac{5}{6}$	......	......	......
1st...	Hay...........	Turnips........	1	7 50	1 30	$134\frac{1}{2}$	22 86	9	$5\frac{5}{6}$	$15\frac{3}{4}$	......	......
2nd..	Turnips........	Wheat..........	1	7 50	1 92	$3\frac{1}{2}$	59	......	$7\frac{1}{4}$	......	......	......
	Aggregate......................		5	37 50	14 88	$159\frac{1}{2}$	27 10	9	$22\frac{3}{4}$	$21\frac{1}{2}$	......	......
	Average per acre..............		......	7 50	2 97	32	5 42	2	$4\frac{1}{2}$	$4\frac{1}{3}$	......	......
	ROTATION "C"											
3rd..	Oats...........	Hay...........	·57	3 42	1 63	11	1 87	......	$2\frac{1}{6}$	......	......	......
4th..	Hay...........	Hay...........	·57	3 42	1 91	$8\frac{1}{4}$	1 60	......	$1\frac{1}{2}$	......	......	......
1st...	Hay...........	Potatoes.......	·57	3 42	4 51	43	7 31	$2\frac{1}{4}$	$15\frac{11}{12}$	......	......	......
2nd..	Corn...........	Oats...........	·57	3 42	1 13	$2\frac{3}{4}$	46	......	4	......	......	......
	Aggregate......................		2·28	13 68	9 18	65	11 24	$2\frac{1}{4}$	$23\frac{1}{2}$	......	......	......
	Average per acre..............		......	6 00	4 00	28·5	4 93	1	$10\frac{1}{3}$	......	......	......
	ROTATION "D"											
3rd..	Wheat..........	Hay...........	1	8 77	4 58	$14\frac{1}{4}$	2 46	......	$1\frac{4}{5}$	......	......	......
1st...	Hay...........	Potatoes.......	1	8 77	8 31	90	15 30	6	$15\frac{7}{12}$	5	......	......
2nd..	Potatoes.......	Wheat..........	1	8 77	1 78	1	17	......	5	......	......	......
	Aggregate......................		3	26 31	14 67	$105\frac{1}{4}$	17 93	6	$22\frac{1}{3}$	5	......	......
	Average per acre..............		......	8 77	4 89	35	5 98	2	7·4	$1\frac{2}{3}$	......	......

(Five years' duration).

IN RAISING CROP.							PARTICULARS OF CROP.						
							Weight.						
Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Roots, ensilage or green-feed.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	Cts.	$ c.	Inch.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
70	.....	13 68	13 68	.....	5 20	3	....	....	5,260	....	18 41	18 41	4 73
45	.....	13 85	13 85	.....	6 28	3	....	....	4,410	....	15 44	15 44	1 59
4 53	68	15 73	15 73	24	.....	7	2,402	1,878	....	....	27 77	27 77	12 04
10 71	.....	75 04	75 04	9·6	3 22	.....	....	....	....	46,680	46 68	46 68	28 36
3 23	85	14 48	14 48	8	.....	9½	2,849	3,865	....	....	36 22	36 22	21 74
19 62	1 53	132 78	.....	.....	.....	.....	....	....	....	....	144 52	.....	.....
3 92	31	.....	26 56	.....	.....	.....	....	....	....	....	....	28 90	2 34
(Five years' duration).													
62	.....	15 28	15 28	.....	7 53	3	....	....	3,660	....	12 81	12 81	-2 47
4 36	45	14 86	14 86	27·9	.....	7	1,810	3,106	....	....	24 42	24 42	9 56
62	.....	13 72	13 72	.....	14 07	3	....	....	1,950	....	6 83	6 83	-6 89
10 86	.....	42 52	42 52	·06	2 01	.....	....	....	....	42,180	42 18	42 18	-0 34
2 46	45	12 92	12 92	27·1	.....	8	1,705	2,500	....	....	22 25	22 25	9 33
18 92	90	99 30	.....	.....	.....	.....	....	....	....	....	108 49		.....
3 78	18	.....	19 86	.....	.....	.....	....	....	....	....	....	21 70	1 84
(Four years' duration).													
71	.....	7 63	13 38	.....	4 50	3	....	....	3,390	....	11 86	20 81	6 43
50	.....	7 44	13 05	.....	4 88	3	....	....	3,045	....	10 66	18 70	5 65
5 41	.....	20 65	36 23	18	.....	.....	....	....	....	6,960	58 00	101 75	65 52
1 36	34	6 70	11 75	18⅓	.....	9	1,240	2,060	....	....	16 52	28 98	17 23
7 98	34	42 42	.....	.....	.....	.....	....	....	....	....	97 04	.....	.....
3 50	15	.....	18 60	.....	.....	.....	....	....	....	....	....	42 56	23 96
(Three years' duration).													
62	.....	16 43	.....	.....	7 64	3	....	....	4,300		15 05	15 05	-1 38
8 97	.....	41 35	.....	.....	.....	.....	....	....	....	12,653	105 27	105 27	63 92
1 70	45	12 87	.....	.....	.....	8	852	1,925	....	....	12 37	12 37	- 50
1129	45	70 65	.....	.....							132 69		
3 76	15	.....	23 55	.....	.....	.....					....	44 23	20 68

CHARLOTTETOWN.

ROTATION "F"

Rotation Year.	Crops.		Area.	Items of Expense: Rent and Manure.	Seed, Twine and use of Machinery.	Manual labour: Hours.	Manual labour: Cost.	Horse labour (including teamster). Hours: Single Horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
	1912.	1913.	Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
3rd..	Wheat.........	Hay............	·6	5 94	4 04	5½	93	......	1⅚	......	......	......
4th..	Hay...........	Barley........	·86	5 94	1 73	3½	60	......	11	¾	......	......
1st...	Barley.........	Turnips........	·86	5 94	1 23	107	18 19	18⅓	9¼	2	......	......
2nd..	Turnips........	Wheat.........	·86	5 94	1 69	3	51	......	7¼	¾	......	......
	Aggregate.....................		3·44	23 76	8 69	119	20 23	18⅓	29⅓	3½	......	......
	Average per acre..............		......	6 90	2 53	34·6	5 88	5·32	8·52	1	......	......

ROTATION "G"

Rotation Year.	1912.	1913.	Area.	Rent and Manure.	Seed, Twine and use of Machinery.	Hours.	Cost.	Single Horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
3rd..	Corn...........	Oats...........	·4	1 89	76	2	34	......	4½	½	......	......
4th..	Oats...........	Hay...........	·4	1 89	69	3	51	......	⅚	......	......	......
5th..	Hay...........	Hay...........	·4	1 89	79	3	51	......	⅚	......	......	......
6th..	Hay...........	Hay...........	·4	1 89	79	2¾	47	......	⅚	......	......	......
7th..	Hay...........	Hay...........	·4	1 89	79	2¾	47	......	⅚	......	......	......
1st...	Hay...........	Oats...........	·4	1 89	75	1½	25	......	6 7/12	1½	......	......
2nd..	Oats...........	Potatoes.......	·4	1 89	3 20	32	5 44	2½	8¾	1¼	......	......
	Aggregate....................		2·8	13 23	7 77	47	7 99	2½	22⅔	3¼	......	......
	Average per acre..............		......	4 73	2 77	16·8	2 85	1	8	1·16	......	......

CHARLOTTETOWN.

(Four years' duration).

in raising Crop.							Particulars of Crop.						
							Weight.						
Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Roots, ensilage or green-feed.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	Cts.	$ c.	Inch.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
62	....	11 53	13 41	....	10 46	3	....	....	2,205	....	7 72	8 98	-4 43
4 05	40	12 72	14 79	25·9	....	7	2,364	....	....	....	31 92	37 12	22 33
8 90	....	34 26	39 83	5·4	....	....	....	....	....	38,315	38 31	44 55	4 72
2 77	51	11 42	13 28	70·66	....	8	969	....	....	....	13 92	16 18	2 90
16 34	91	69 93	....	....	....	....	....	....	....	....	91 87	26 71	....
4 75	26	....	20 32	....	....	....	....	....	....	....	....	....	6 39

(Seven years' duration).

Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Roots, ensilage or green-feed.	Total value.	Value of crop per acre.	Profit or loss per acre.
1 73	34	5 06	12 65	19	....	7	901	1,370	....	....	11 75	29 37	16 72
28	....	3 37	8 42	....	2 87	3	....	....	2,345	....	8 21	20 52	12 10
28	....	3 47	8 67	....	3 31	3	....	....	2,095	....	7 33	18 32	9 65
28	....	3 43	8 57	....	3 19	3	....	....	2,145	....	7 51	18 77	10 20
28	....	3 43	8 57	....	3 23	3	....	....	2,120	....	7 42	18 55	9 98
2 85	34	6 08	15 20	32	....	$6\frac{1}{2}$	647	....	....	....	8 95	22 37	7 17
4 15	....	14 68	36 70	$13\frac{1}{4}$	....	....	....	1,240	....	6,640	55 33	138 32	101 62
9 85	68	39 52	....	....	....	....	....	....	....	....	106 50	....	....
3 50	24	....	14 11	....	....	....	....	....	....	....	....	38 03	23 92

SOIL CULTURAL EXPERIMENTS.

The land set apart for the soil cultural experiments was given a preliminary testing out in 1914. Four acres were planted with potatoes, no manure or fertilizer being applied. The field was given good cultivation throughout the season. The potatoes were sprayed regularly with Bordeaux mixture and Paris green.

There were 112 plots of potatoes in all. Great variations were found in the soil. Yields ranging all the way from 27 bushels per acre to 242 bushels per acre were recorded, the average being 90 bushels and 25 pounds per acre.

About 8 acres of the balance of the area was sown with Banner oats, without manure or other fertilizer. This was also used as a preliminary test, 181 plots of one-sixtieth acre being carefully measured and the returns recorded. The lowest yield was at the rate of 23½ bushels per acre, the highest a little over 50 bushels per acre, and the average for all, 35 bushels and 9 pounds. The greater part of the above land was tile drained in the early spring of 1914. The tramping and opening of the ditches with the plough when the land was wet, baked some sections worse than others, which may account for some of the extreme variations.

Experiments will be undertaken to get further information regarding:—

(1) The conservation and increase of soil fertility.
(2) The control and eradication of weeds.
(3) The improvement of neglected land.
(4) The conservation of soil moisture.
(5) The value of underdrainage.

DRAINAGE.

The land on the west side of the railway, known as the Connolly and Johnston properties, comprising in all about 18 acres, was tile drained in the spring. The drains were laid 33 feet apart as the land is all to be used in cultural experimental work. This work was completed in time for the spring seeding of almost the whole of the area.

The low lands on properties purchased from Harry Connolly, Judge Haszard and St. Dunstan's College were drained during the summer. The main from this system discharges into the ditch of the Prince Edward Island Railway just south of the De Blois road. A very old well was discovered during the ditching in the Harry Connolly field. It was well stoned and had an abundance of water during midsummer. A reinforced cement cover was placed over it. This well was connected with the tile system by a short overflow pipe, and will be very convenient for watering stock in the future. A 6-inch main was carried back to the swamp area that lies just north of the property purchased from the St. Dunstan's college.

IMPROVEMENTS.

Three rows of trees that divided the several properties purchased for the Experimental Station in 1913 were removed and the land stumped during the summer and autumn.

Shore sand was applied to the drained peat swamp just south of the plum orchard during the winter. It is expected that the sand will greatly improve the texture of this soil.

The junior grader used in connection with the split-log drag kept the farm roadway free from grass and in splendid condition throughout the season.

CHARLOTTETOWN.

Old Island black Oats. A good stand after corn. Charlottetown, P.E.I.

Making Hay on the Marsh Land at Experimental Farm, Nappan, N.S., 1914.

EXPERIMENTAL FARM FOR NOVA SCOTIA, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

WEATHER CONDITIONS.

During the winter of 1913-14 a most satisfactory covering of snow remained on the ground from the 25th of December to the second week in March. During the latter part of March and the first part of April, however, there was alternate thawing and freezing which killed the clover and reduced the hay crop considerably. April was unsettled throughout. May gave promise of being a favourable month, but a change took place toward the latter part and June came in with light flurries of snow and low temperatures. Notwithstanding this, all grain was sown during the occasional fine days of the last week in May and the first of June. The weather continued cool during the remaining part of the month. Nevertheless, germination took place much more rapidly this year than last. The grain was only seven days in showing above the ground, whereas last season it was from eighteen to twenty. Neither corn nor grain made much growth until the latter part of July, then both came on very rapidly. July and August were, undoubtedly, the best growing months. Very favourable conditions existed until the latter part of September, from which time dull, cold weather prevailed until the end of the season, with an occasional fine day. Up to the 16th of October weather conditions were most favourable for harvesting, but a cold wet spell ensued after that date, which caused some delay. Heavy frosts were recorded during the early part of the month. Only fair progress could be made in the fall ploughing, as much of the land was too wet. The total precipitation was 2·46 inches. Cold, wet weather prevailed throughout the first three weeks in November. The remaining part was very fine and mild. The total precipitation for this month was 2·97 inches. The weather was rather unsettled during December. The first two weeks were fairly fine, with occasional snow flurries. Fairly heavy showers, with low temperatures, characterized the latter part.

It may be said that the fall was a very open one with considerable rainfall, followed by a very open winter with much mild weather during the latter part.

SOME Weather Observations taken at Nappan Experimental Farm, 1914.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	
	°	°	°	Inches.	Inches.	Inches.	Hours.
January	46	—19	13·5	1·30	17·00	3·00	92·40
February	42	—27	7·5	·30	23·00	2·60	138·50
March	46	8	30·17	1·73	4·00	2·13	107·85
April	61	8	33·94	1·89	18·00	3·69	172·05
May	79	24	49·03	·75	....	·75	147·10
June	77	26	54·19	4·23	....	4·23	243·50
July	84	35	61·54	3·61	....	3·61	255 00
August	81	40	62·84	2·95	....	2·95	210·80
Sept mber	84	33	56·25	3·05	....	3·05	161·75
October	69	20	47·02	2·46	....	2·46	139·35
November	60	07	33·59	2·97	....	2·97	85·75
December	51	—17	20·22	1·46	....	1·46	110·15
Total for year				26·70	62·00	2·90	1,864·20
Average for six years				30·83	56·74	36·71	2,003·04
Total for six growing months, April to September				16·48	13·0	18·28	1,190 20
Average of five years for six growing months, April to Sept.				17·56	6·3	18·19	1,298·65

FIELD CROP YIELDS.

The yields of crops grown in field lots and under field conditions averaged as follows in 1914:—

Area.	Crop.	Yield per acre.		Yield per acre.	
Acres.		Tons.	Lb.	Bush.	Lb.
	Mangels	8	1,507	....	
	Turnips	18	431	607	11
5	Corn	10	1,893	....	
50	Marshland Hay	1	968	....	
	Upland Hay	2	241	....	
$3\frac{1}{8}$	Wheat	....		31	31
7	Oats	....		62	21
2	Barley	....		54	2
11	Mixed grain	....		40	10
	Potatoes	....		229	30

COST OF PRODUCTION OF FIELD CROPS.

In computing the cost of the various field crops, fixed values as given on page 182 of this report have been used. The items for which there are no fixed charges have been valued as follows:—

Twine	$0 15	per pound.
Grass seed	0 10½	"
Clover	0 25	"
Turnips	0 25	"
Mangels	0 25	"
Corn	0 04	"
Potatoes	0 50	bushel.

The following table gives the approximate cost of the various field crops:—

Crop.	Yield per acre.				Cost to Produce.		
					Per acre.	Per ton.	Per bush.
	Tons.	Lb.	Bush.	Lb.	$ cts.	$ cts.	cents.
Turnips	18	431	607	11	45 56	2 65	7·88
Ensilage corn	10	1,893			30 75	2 80	
Potatoes			299	30	49 25		13·10
Oats			62	21	15 88		24·2
Wheat			31	31	13 8		43·7
Barley			54	22	12 78		23·7

ROTATION OF CROPS.

The three rotations which are in operation on this Farm were again continued according to the following schedule, and accurate notes were taken during the season. The expense incurred in producing the various crops grown on these rotations will be found in detail in the tables which follow.

The importance of this work to the average farmer justifies our emphasizing it once again. Only by following some regular rotation can the agriculturist engaged in mixed farming realize the greatest returns. The three rotations conducted at this Farm and explained in detail in the following pages, were chosen as being best suited to the general conditions in Nova Scotia. They may quite easily be modified to conform with any particular conditions that may be met with and beneficial results will undoubtedly follow the adoption of any one of them.

Where the agriculturist has sufficient pasture at his disposal, either the rotation "B" or "D" would probably be best suited to his conditions. On the other hand, the farmer having a fairly large herd of cattle, and no available pasture, would derive the greatest benefit from rotation "C." By a close and intelligent study of his particular conditions, and the adoption of the most suitable rotation, the agriculturist will have taken a very decided step toward the "increased agricultural production" which is of such great importance at the present time.

The following is a description of the three rotations in operation here:—

ROTATION "B" (FIVE YEARS' DURATION).

First year.—Roots or corn, manured at the rate of 25 tons per acre.

Second year.—Grain, seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds timothy per acre.

Third year.—Clover hay, after which aftermath of clover is ploughed under in the autumn.

Fourth year.—Grain, seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds timothy per acre.

Fifth year.—Clover hay, ploughed in the autumn.

ROTATION "C" (FOUR YEARS' DURATION).

First year.—Roots or corn, manured at the rate of 20 tons per acre.

Second year.—Grain, seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Pasture, ploughed in the fall for roots.

ROTATION "D" (FIVE YEARS' DURATION).

First year.—Roots or corn, manured at the rate of 15 tons per acre.

Second year.—Grain, seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds timothy per acre.

Third year—Clover hay, aftermath ploughed under in the autumn for roots or corn again.

In order that comparative results may be obtained from year to year in estimating the cost, etc., of the various operations conducted on these rotations, it was deemed necessary to establish fixed valuations from which calculations could be made. Accordingly, these values are used during the different years, regardless of fluctuations in the rate of wages and value of products. These constant values, moreover, permit of a much fairer comparison of the different rotations and of the periods of years within a single rotation. These values, including cost and return, are given on page 182 of this report.

NAPPAN.

ROTATION "B"

Rotation Year.	Crop. 1913.	Crop. 1914.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour: Hours.	Manual labour: Cost.	Horse labour (including teamster). Hours: Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.	Value of horse labour.
			Acre	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.	$ c.
4th...	Clover Hay	Grain.......	8	64 00	21 80	16	2 72	......	120	......	10	......	45 60
3rd...	Grain......	Clover Hay	8	64 00	29 20	29·2	4 96	3·06	21·16	......	......	......	8 01
2nd...	Roots.....	Grain.......	8	64 00	21 80	16	2 72		104	......	10	......	40 16
1st....	Green Crop	Roots.......	8	95 04	10 80	420	71 40	268	144	......	20	......	130 92
5th...	Green Crop	Soiling Crop	8	......	......	......	......	......	......	......	......	......	......
	Aggregate..............		40	287 04	83 60	481·2	81 80	271·06	389·16	......	40	......	224 69
	Average per acre.........		......	7 18	2 61	15·0	255	8·47	12·16	......	1·25	......	7 02

ROTATION "C"

Rotation Year.	Crop. 1913.	Crop. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour: Hours.	Manual labour: Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.	Value of horse labour.
3rd...	Grain......	Clover Hay	5	40 00	18 25	18·2	3 09	1·9	13·20	......	......	......	4 99
2nd...	Roots.....	Grain.......	5	40 00	13 62	10·0	1 70	......	66·25	......	6·25	......	25 52
1st....	Pasture....	Roots–Corn	5	40 00	13 62	742·0	126 14	104·0	73·75	......	12·50	......	59 15
4th...	Clover Hay	Pasture.....	5	40 00	7 62	......	......	......	......	......	......	......	......
	Agregate................		20	160 00	53 11	770·2	130·93	105·9	153 20	......	18·75	......	89 66
	Average per acre.........		......	8 00	2 65	38·5	6·55	5·3	7·66	......	·94	.....	4 48

ROTATION "D"

Rotation Year.	Crop. 1913.	Crop. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour: Hours.	Manual labour: Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.	Value of horse labour.
1st....	Clover Hay	Roots......	5	40 00	9 30	600·00	102 00	162·50	108·50	......	12·50	......	86 70
3rd...	Grain......	Clover Hay	5	40 00	18 25	18·20	3 09	1·90	13·20	......	......	......	4 99
2nd...	Roots......	Grain.......	5	40 00	13 62	10·00	1 70	......	68·25	......	6·25	......	26 23
	Aggregate..............		15	120 00	41 17	628·20	106 79	164·40	189·95	......	18·75	......	117 92
	Average per acre.........		......	8 00	2 74	41·88	7 11	10·9	12·66	......	1·25	.....	7 86

(Five years' duration.)

in raising Crop.						Particulars of Crop.						
						Weight.						
Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	Cts.	$ c.	Inch.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
	134 12	16 76	21			14,900	20,205			189 41	23 67	6 91
	106 17	13 27		6 76				31 390		109 86	13 73	0 46
	128 68	16 08	24·5			13,247	26,318			185 11	23 13	7 04
	308 16	38 52	6.6	2 22					277,465	277 46	34 68	—3 84
	677 13									761 84		
		21 15									23 80	2 65

(Four year's duration).

	66 33	13 26		5 36				24,715		86 50	17 30	4 04
	80 84	16 16	19·7			9,203	23,376			138 78	27 75	11 59
	238 91	47 78		4 36					109,469	109 47	21 89	—25 89
	47 62	9 52								102 25	20 45	10 93
	433 70									437 00		
		21 68									21 85	0 17

(Three years' duration).

	238 00	47 60	8·1	2 72					174,997	175 66	35 13	—12 47
	66 33	13 26		6 88				19,280		67 48	13 49	0 23
	81 55	16 31	22·8			7,800	14,540			107 08	21 41	5 10
	385 88									350 22		
		25 72									23 34	— 2 38

NAPPAN.

COMMERCIAL FERTILIZERS FOR TURNIPS.

Five varieties of turnips were sown in plots of 1 acre each, one-half the plot in each acre being fertilized with barnyard manure and commercial fertilizer. In all cases the barnyard manure was applied at the rate of 25 tons per acre. The commercial fertilizer was applied at the rate of 400 pounds per acre, and was made up in the following proportions: Superphosphate, 1½ pounds; bone meal, 1½ pounds; nitrate of soda, 1 pound; muriate of potash, 1 pound.

The purpose of this experiment was to ascertain what benefit would be derived by the use of such a fertilizer in conjunction with barnyard manure in growing turnips.

When harvested, the roots were carefully weighed and the results computed. These results were as follows:—

COMMERCIAL Fertilizer for Turnips.

Variety.	Size of Plot.	Date of Sowing.	Fertilizers Applied per Acre. Barnyard Manure.	Commercial Fertilizer. Weight.	Commercial Fertilizer. Value.	Yield per acre.		Value of Crop at 6cts. per bush.	Profit or Loss due to Commercial Fertilizer.
	Acres.		Tons.	Lb.	$ cts.	Bush.	Lb.	$ cts.	$ cts.
Jumbo	½	June 24	25	....	....	502	40	30 16	....
"	½	" 24	25	400	7 76	471	10	28 27	−9 65
Rennie's Prize	½	" 24	25	....	....	371	....	22 26	....
"	½	" 24	25	400	7 76	539	....	32 34	2 32
Magnum Bonum	½	" 24	25	....	....	726	40	43 60	....
"	½	" 24	25	400	7 76	699	40	41 90	−9 38
Sutton's Champion	½	" 24	25	....	....	627	20	37 64	....
"	½	" 24	25	400	7 76	652	40	39 16	−6 24
Canadian Gem	½	" 24	25	....	....	537	30	32 25	....
"	½	" 24	25	400	7 76	662	....	39 72	−0 29

In comparing this year's results with those of last year, we find them very similar; that is, both indicate that the foregoing combination of manure and commercial fertilizer does not give a sufficient increase in crop to justify its use. This experiment has now been conducted for three consecutive years, and the results obtained coincide. We are justified, therefore, in assuming them fairly conclusive.

The following table gives the average of the results obtained in this experiment during the three years it was conducted:—

Plot.	Average yield for three years with manure alone. Tons. Lb.		Bush. Lb.		Average yield for three years with manure and fertilizer. Tons. Lb.		Bush. Lb.		Average loss for the three years. $ cts.
1	28	1,700	795	6	25	1,556	859	16	3 26
2	19	460	641	0	21	353	705	53	3 27
3	22	1,143	752	23	22	1,965	766	5	6 29
4	19	806	646	45	18	806	613	26	9 11
5	17	1,946	599	6	15	1,706	695	6	1 35

NAPPAN.

BREAKING NEW LAND.

Some 16 acres of new land were broken up during the summer months. The stumps were very thick in parts, but well rotted, making the stumping quite easy. The piling and grubbing out of the second-growth spruce and fir was the most tedious job. The land was very free from stone, but very rough, which will necessitate two ploughings before it can be cropped to any extent. It is also very wet, and should be underdrained before cropping. The total cost up to date for stumping, piling, burning and breaking these 16 acres was $387.31, or a cost per acre of $24.20. It will require one more burning off to be clear of all stumps. Part was harrowed once. When the whole field, which is about 25 acres in extent, is cleared and ploughed it will add a great deal to our workable land, and will be a great improvement to the Farm.

Just east of this 25-acre field, some 30 to 50 acres were logged during the winter of 1913-14, yielding 2,500 nice logs, spruce and hemlock. These, when manufactured into lumber, gave some 123,092 feet of excellent lumber, which is being used on the Farm for constructing new buildings and repairing others. During the spring and winter of 1914, some 15 acres of this land were cleared, all the material taken off producing about one hundred cords. Some poles were cut for repairing back fences.

A record of the cost of chopping and clearing this land is being kept; also the value of the material taken off, in order to get more data on the cost of clearing new land.

EXPERIMENTAL STATION, FOR ANNAPOLIS AND CORNWALLIS VALLEYS, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. SAXBY BLAIR.

The Field Husbandry work at this Station during the past season has been largely that of growing fodder corn, and grain for stock, and the clearing of land for future crops. Seventeen acres of land cleared last season and four acres cleared in 1912 were seeded to oats. Ten acres of corn were grown on land between the apple trees, which ground was previously in potatoes. Five acres in the orchard were planted also to turnips. No rotation work has been attempted, and will not be possible until more land has been cleared. Fifteen acres have been cleared of green stumps ready for seeding next spring.

CHARACTER OF SEASON.

The season has on the whole been a favourable one for field crops. The spring was late, and seeding was not possible until after the middle of May. During June, grain crops came on well. The corn, on the other hand, owing to cool weather in June, made very slow growth. Early seeded corn in some places was damaged by the last frost, on June 4. This frost was very light and did no damage at this Station to the corn, which was just coming through. July was a dry month, only 1·45 inch of rain having fallen, and this checked growth somewhat. The precipitation during June being 4·2 inches, there was a good reserve for the crops, and they did not suffer as much as would have been the case had June been dry. July weather was cool, with no hot drying winds, which also materially assisted in assuring a good moisture supply. August and September were good months for crops generally and, for the most part, the grain crops were harvested in good condition. September being warm, corn made good growth and was fairly well matured when harvested.

SOME Weather Observations taken at Kentville Experimental Station, 1914.

Month.	Temperature F.			Precipitation.				Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	19·68	50	−5	1·18	16·25	2·80	·55	91·6
February	14·19	43	−17	·79	18	2·59	·40	118·7
March	30·72	50	11	3·13	6	3·73	·63	118·2
April	36·8	72	16	1·48	8·5	2·33	·93	196·
May	50·72	84	23	1·26	2	1·46	·78	189·6
June	56·2	82	32	4·2	....	4·2	1·10	250·3
July	62·88	85	39	1·45	....	1·45	·61	238·9
August	63·	87	40	2·58	....	2·58	·55	211·1
September	57·6	88	35	3·65	....	3·65	1·06	173·8
October	49·5	70	25	1·90	....	1·90	·43	158·2
November	36·4	65	5	3·09	1	3·19	·80	109·7
December	22·89	56	6	1·57	10·18	2·58	·68	85·1
Total for year				26·28	61·93	32·46	....	1,941·2
Average for year				....	....	2·70	....	161·7
Total for six growing months, April to September				14·62	1·05	15·67	....	1,259·7
Average for six growing months, April to September				....	....	2·61	....	209·9

OATS.

The 17 acres which were cleared of green stumps and ploughed in 1913 were seeded to Banner oats on May 28 and 30. This land was twice harrowed, after which all the roots harrowed up were gathered, piled and burnt, and the stone removed. This land is only fairly even and, as would be expected on such land, is not very level. It was thought desirable to seed this field to timothy and clover for hay next season. These were sown at the rate of 8 pounds Canada red clover, 2 pounds alsike clover and 8 pounds timothy seed per acre. The oats were seeded with the disc drill at the rate of 3 bushels per acre. Five acres of this land were fertilized broadcast with a complete fertilizer made up of nitrate of soda, acid phosphate and muriate of potash, which contained 4 per cent of nitrogen, 8 per cent of phosphorus and 5 per cent of potash. This was sown at the rate of 400 pounds per acre, after the second harrowing, and harrowed in before seeding. As would be expected, the growth of grain, clover and grass was uneven, but on the whole a fairly even stand of clover and timothy has been secured. The crop was harvested on the 9th and 10th September, the following yields being obtained:—

	Yield per acre. Bushels.	Total Yield. Bushels.
5 acres Banner oats with fertilizer	53·2	266
12 acres Banner oats without fertilizer	40·6	487·2

On June 4 a field of 4 acres was seeded to Improved Ligowo oats at the rate of 3 bushels per acre. This land was taken out of green stumps in the fall of 1912 and was in buckwheat in 1913, which crop was ploughed under. The oats were harvested September 16. No fertilizer has been used on this land. The yield was 37·8 bushels per acre, or a total of 151·2 bushels.

CORN.

The soil on which the corn was planted is light and of medium fertility. This land was in potatoes in 1913, and for that crop was fertilized with a complete fertilizer at the rate of 500 pounds per acre; it was cleared from green stumps in 1911, and was in buckwheat in 1912, which crop was ploughed under. This area consists of strips 30 feet wide between the orchard trees, which are planted 40 feet apart, the corn being sown in rows 3½ feet apart and at the rate of 40 pounds per acre.

The ground was manured at the rate of 15 tons stable manure per acre, put on with the manure spreader and ploughed under. Fertilizer at the rate of 300 pounds per acre was sown broadcast and harrowed in before the corn was planted. The fertilizer was made up of nitrate of soda, sulphate of ammonia, acid phosphate and muriate of potash, and contained 4 per cent nitrogen, 8 per cent phosphorus and 5 per cent potash. Nitrate of soda and sulphate of ammonia were used in equal proportions in making up the above fertilizer. The first corn was seeded May 22, and another area on the 25th. The balance of the corn was planted June 3. The yield of corn is as follows:—

	Yield per acre. Tons.	Lb.
2 acres Compton's Early..	13	925
2 " Longfellow..	13	400
6 " "	11	225

The total yield of corn from this area was 120 tons, an average of 12 tons per acre. The Compton's Early gave a little better yield per acre, but was not as well matured at the time of harvest as the Longfellow. The 2 acres each of Compton's Early and Longfellow were planted at the same time, June 3. The land on the upper areas of this field, is a little better than the lower part, which accounts for the heavier growth, and also part of

the corn was frosted on October 1, and dried out before harvest, which would lessen the yield somewhat. The corn was harvested the last week in September and the first week in October, and, on the whole, was fairly well matured.

TURNIPS.

Two acres of turnips were sown on June 3 on an area which was in turnips last season. This land was used because other suitable land was not available. Two acres were worked up in the orchard adjoining the corn, and seeded June 11. These fields were manured with 15 tons stable manure per acre and 400 pounds fertilizer made up of nitrate of soda, sulphate of ammonia, acid phosphate and muriate of potash, containing 4 per cent nitrogen, 8 per cent phosphorus and 5 per cent potash. This fertilizer is similar to that used on the corn field.

One acre, on which winter rye had been cut for green feed, was seeded to turnips. This area was manured with 15 tons stable manure per acre, ploughed and harrowed, after which it was rolled. The seed was sown on the level ground with the hand seed drill on July 4. The growth was good and, considering the date of seeding, a very good crop was obtained. The turnips were harvested November 9 to 12, and yielded as follows:—

	When seeded.	Yield per acre. Bushels.	Lb
2 acres Lapland	June 3	634	35
1 " "	" 11	685	25
1 " Kangaroo	" 11	711	10
½ " Lapland	July 4	496	40
½ " Kangaroo	" 4	485	20

Total turnips harvested from field areas, 3,013 bushels 10 pounds.

WINTER RYE.

One and one-half acres of winter rye were sown on September 12, 1913, on land which had been in grain; it was seeded at the rate of 1½ bushels per acre. This was fit for cutting for green feed for stock the first week in June, and furnished excellent feed during the next two weeks. This crop was followed with turnips, as stated above.

HAY.

As yet the area in hay is limited, and consists of 8 acres of marsh land which it is proposed to drain and put into proper shape next season. A greater part of this area was dyked last season, and the quality of hay produced is not very high. The yield was 12 tons 635 pounds. In addition to this, some hay was gathered at other places on the farm, making the total crop harvested 16½ tons.

FENCING.

In order to give some pasturage to the stock it was necessary to put a fence along the west side of the ravine running from the main road to the back of the Farm. This has been completed only in part, but sufficient to inclose the stock on the lower parts of the ravine. Fifty-four hundred feet of wire fence was erected for this purpose, and consists of cedar posts set a rod apart and six strands high of plain wire. This fence, for the most part, was put on very rough ground, which made the work very difficult.

KENTVILLE.

ROADS.

In order to get a road for stock to the upper fields without having to fence the principal road through the Farm, it was considered advisable to construct a road along the west edge of the ravine, which made it necessary to clear and stump an area about 30 feet wide for a distance of about 2,850 feet. This road has been partially graded, but will require considerable additional work next spring. The fence was placed along the west side of the road.

DRAINAGE.

In order to render the land uniform, two underdrains were put in across a low-lying area in the field given up to permanent fertilizer plots. These drains were 1,500 feet long. In addition to this, short drains amounting to 500 feet were necessary at other places, making a total of 2,000 feet of underdrains put in.

CLEARING LAND.

Twenty acres of land have been cleared of stumps during the past season. Eighteen acres of this will be ready for crop next season, and the other 2 acres are those cleared for a road and fence. One 7-acre block cleared this year, which it is proposed to plant with corn next year, has cost as follows:—

420 pounds dynamite at 18 cents per pound	$ 75 60
Fuse, 1,250 feet	11 25
Caps, 1,000	12 50
Dynamiting	61 25
Cutting sprout growth	35 00
Stumping	591 50
Cleaning roots, piling and burning	213 99
Ploughing	169 75
Removing stone	108 75
Harrowing, piling and burning roots	97 35
Cross ploughing	68 50
Removing roots and stone	79 30
Harrowing and removing roots	62 80
Total cost for seven acres	$1,587 54
Cost per acre	226 79

KENTVILLE.

EXPERIMENTAL STATION FOR NEW BRUNSWICK, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

WEATHER CONDITIONS, 1914.

The winter was unusually cold and, at times, intensely so, with the result that records for January, February and March show an average mean temperature 2·5 degrees lower than the average mean for these same months during the past forty years. The total snowfall was not above the average, but covered the ground continuously from December 24 to April 10, thus frost did not penetrate so deeply as in more open winters. April was characterized by cold, high winds and excessive precipitation. May was also cold, windy and backward, but the rainfall was unusually light, thus making conditions favourable for spring cultivation. Cold, backward weather continued throughout June and the fore part of July, consequently all crops made slow growth till almost the 1st of August, at which date such crops as corn and tomatoes were particularly unpromising. Climatic conditions during August and September however, favoured rapid growth and crops eventually were very good. Ideal weather conditions rendered it possible to harvest hay, grain, roots, etc., in excellent condition.

SOME Weather Observations taken at Experimental Station, Fredericton, 1914.

Month.	Temperature F.			Precipitation.	Total Sunshine.
	Highest.	Lowest.	Mean.		
	°	°	°	Inches.	Hours.
January	51	−11	22	4·1	81
February	38	−20	12	2·9	123
March	60	− 9	30	6	124
April	64	− 3·5	33·6	4·54	200·9
May	89·5	24	54·9	1·095	189
June	88·5	28	58·2	4·34	262
July	88·5	40	65·2	2·595	260·5
August	85	39·5	64·8	3·73	205
September	89·5	30	59	2·78	186·8
October	77·5	12	47·7	2·775	129·71
November	57	3	30·58	2·75	98·4
December	47	−22·5	17·19	2·03	133·45
Total for year				39·635	1,993·76
Total for six growing months, April to September 1914				19·08	1,304·2
Total for six growing months, April to September 1913				16·9	1,247
Average for 41 years				43·8	1,996

The following records regarding field operations and the weather may be of interest:—

First seeding of field grain	May 23.
First planting of potatoes	May 9.
First sowing of corn	June 3.
Date of commencing hay harvest	July 20.
Date of commencing grain harvest	September 9.
Date of commencing cutting corn	September 30.
Date of freezing up	November 18.

CROP YIELDS.

OATS.

Thirty-five acres of newly cleared land were sown to oats. The land having been ploughed once only, the surface was very uneven, and contained many small roots. The seed-bed was therefore not ideal, and the seed had to be sown broadcast. A number of varieties were sown, the rate of seeding being 3 bushels per acre.

Seeding commenced May 23, 4½ acres of Banner oats being sown on land cleared and ploughed the preceding year. No manure or commercial fertilizer was used, and the total yield was 220 bushels or 44·4 bushels per acre. Four and three-quarter acres sown to Newmarket oats on May 27 yielded 200 bushels, an average of 42·1 bushels per acre. The remaining 25¾ acres were sown to Early Blossom, P. E. I. Banner, Home Grown Banner and Newmarket oats on May 28, 29 and 30, yielding 583 bushels or 22·7 bushels per acre. The average yield per acre for the whole crop was 22⅝ bushels.

BUCKWHEAT.

Seven and one-half acres of newly cleared land were ploughed and sown to buckwheat on June 27, at the rate of 1 bushel per acre. With the seed were sown 220 pounds per acre of 2-5-8 fertilizer. The land was very rough and uneven and in an unfavourable condition for crop production. The total yield was 136 bushels or slightly over 18 bushels per acre.

The cost of production of these crops cannot be given, as the clearing of new land is not properly chargeable to the first crop grown thereafter.

TURNIPS.

Turnips were sown upon 8 acres of land that had produced corn the previous year. Owing to the prevalence of mustard it was considered best to use a hoed crop again on this land.

In 1913 the land was manured for corn at the rate of eighteen 35-bushel loads of horse manure and 468 pounds of 3·6-10-5·5 fertilizer mixture per acre. After the corn was harvested the land was ploughed, and in the following spring it was worked early, and at intervals, with drag and disc harrows. Sixteen 35-bushel loads of horse manure were applied and incorporated with the soil. Three hundred pounds of basic slag and 265 pounds of 3-10-4 fertilizer per acre were applied broadcast, and the land was put up in shallow ridges with a potato planter. The ridges were then rolled and the turnip seed sown with a hand drill at the rate of 4 pounds per acre, a quantity which was found scant enough in portions of the field. One and one-half acres had to be re-seeded owing to destruction by fly, and a further portion of the field was only saved from destruction by spraying the young plants with arsenate of lead.

To test the value of the 3-10-4 fertilizer, one-half acre, which received none of the fertilizer in 1914, was used as a check plot and compared with a contiguous half-acre plot. The increased yield per acre due to the fertilizer was 43 bushels 20 pounds of turnips, which, valued at 10 cents per bushel, would amount to $4.34. The cost of the fertilizer per acre was $4.89.

The total yield from 8 acres was 188 tons 353 pounds, making an average yield per acre of 940·8 bushels. The total cost of labour required to raise and harvest the turnips was $360.66, which is equal to $45.08 per acre, $1.91 per ton or 4·8 cents per bushel.

SUGAR BEETS.

Three varieties of sugar beets were grown on land which in 1913 produced a crop of corn, after having received an application of eighteen 35-bushel loads of horse manure per acre. In the fall the land was ploughed and the following spring it was worked early. An application of sixteen 35-bushel loads of horse manure was incorporated with the soil, after which the beet seed was sown on June 12, in rows 30 inches apart. Frequent inter-row cultivation was given, and the plants were thinned to 8 inches apart. The crop was harvested on October 31, the varieties tested yielding as follows:—

Vilmorin B	484 bushels per acre.
Vilmorin A	431·7 " "
Très Riche	410 " "

CARROTS.

Five varieties of carrots were grown on land which was treated both in 1913 and 1914 as for sugar beets. The plants were thinned to 4 inches apart, and the varieties tested yielded as follows:—

Giant White Vosges	725·3 bushels per acre.
Improved Short White	481 " "
Mammoth White Intermediate	471·6 " "
White Belgian	418·1 " "
Ontario Champion	411·5 " "

INDIAN CORN.

Fourteen acres of corn were grown on naturally well-drained sandy loam soil, 10 acres of which had produced potatoes and turnips the previous season, 1 acre had produced corn, and the rest was from fall-ploughed sod. The field was badly infested with mustard, hence it was deemed advisable to again use a hoed crop on this area. In preparation for the corn the land received a dressing of sixteen 35-bushel loads of horse manure and 250 pounds of 4·37-9·37-6·25 fertilizer per acre. This field was kept well cultivated, the whole area being carefully hand-hoed once, and that which was ploughed out of sod being hoed twice in order to control mustard and couch-grass. The corn was cut on the first of October, at which date it was fairly well eared, the grain being in the thin-milk stage, and the stalks from 8 to 9 feet in height. The average yield was 9 tons per acre, the cost of labour to raise, harvest and put in the silo was $26.49 per acre or $2.94 per ton.

A test showed that the application of 250 pounds of 4·37-9·37-6·25 fertilizer increased the yield of Early Longfellow corn 674 pounds per acre. Valuing corn at $3 per ton, the increased value of the crop per acre due to the fertilizer was $1.01; the cost of the fertilizer, however, was $3.61 per acre.

CLEARING LAND.

Before seeding, the stones and roots were picked from 30 acres of land which had been ploughed the previous fall. At a total cost of $4,865.24, 56 acres were stumped and left ready for cropping in 1915. While part of this land was comparatively free from stone, the rest was extremely stony and rocky, containing both large and small boulders, the breaking up and removal of which materially increased the cost of clearing. The method employed was to first break the boulders and shatter the stumps by

means of stumping powder, then remove the stone and pull the remaining parts of stumps by teams. After piling and burning the stumps, the land was ploughed. An efficient power stump puller capable of lifting 25 tons weight was tried, but the additional labour necessary to manipulate the tackle and remove the earth from the roots of the raised stump made the method more expensive than the one previously described. On an average a man can blow out a stump in about three minutes at a cost of from 10 to 35 cents for stumping powder, and it was found that the explosives are most effective when the ground is wet. The average cost per acre totally to clear the land, plough it, removing all stones touched by the plough, and thus leave the ground in condition for cropping was $86.88. The highest cost was on 4¾ acres of very rough and rocky land which it was desired to clean up thoroughly for orchard purposes.

FENCING.

Five hundred and sixty-five rods of fencing of No. 9 woven wire, 4 feet high, were constructed along the Wilsey road, the main farm road, and about the buildings. Turned cedar posts set 1 rod apart were used. Two hundred and ninety rods of divisional fence between fields, with ordinary cedar posts, were also erected, as well as 160 rods of special 5-foot woven wire poultry fence which was placed above close boarding 2 feet high. Two hundred and thirty rods of woven wire fencing and 89 rods of three strand barbed wire fence were temporarily erected on stakes, to inclose pastures. The season's fencing aggregated 2⅝ miles of permanent fence and 1 mile of temporary fence, and necessitated the setting of 575 turned cedar posts, 310 plain cedar posts and 325 stakes, with which were used twenty stretching posts.

DRAINAGE.

From five to twelve men were fairly steadily employed from May till November digging drains and laying tiles, and in all about 30 acres were underdrained. Most of the drains were placed 30 feet apart, with all tile at least 3 feet below the surface. These drains have been so placed as to become a part of a complete drainage system, and so far have done excellent work. Much time has been spent in draining wet spots that it is desired to crop, and in constructing mains preparatory to next season's work.

Some of the work was done by contract, but in no case was it possible to keep the cost as low as is reported for some places, owing to the fact that after the first foot of soil had been removed the use of picks was constantly necessary in order to loosen the stiff subsoil. Also it was necessary to use considerable dynamite to remove boulders.

The whole Station between the Canadian Pacific railway and the St. John river was surveyed for drainage purposes by Mr. W. R. White, and the work will be proceeded with systematically from year to year.

Herewith is a statement of the tiles laid and cost:—

	Number.	Cost.	Rods.
Tiles	17,220 three-inch	$ 403 20	1,044
"	5,344 four-inch	160 20	324
"	1,096 six-inch	166 84	66
Labour		2,676 33	
Dynamite, tar paper, etc		25 48	
Total		$ 3,432 05	1,434

EXPERIMENTAL STATION FOR EASTERN QUEBEC, STE. ANNE DE LA POCATIERE, QUE.

REPORT OF THE SUPERINTENDENT, JOSEPH BEGIN.

WEATHER CONDITIONS, 1914.

The season of 1914 was characterized by sudden variations in temperature and a meagre precipitation, especially during the summer months. Although the snow disappeared at an early date, the frost was not out of the ground until the beginning of May. Very wet and cool weather prevailed during May and June, rain being recorded on twenty-nine different days between May 1 and June 25, consequently the spring was unfavourable for seeding operations. The first sowing of grain was done on the 9th of May, and the following day at least an inch of snow fell. This grain did not come up until May 23, nevertheless it yielded 5 per cent more grain weighing 2 pounds more per bushel than did grain sown on another field having similar soil conditions, on May 18. This fortunate experiment tends to show the advisability of sowing grain as early as possible, even when the spring is cold. The precipitation in July and August was 0·64 and 1·04 inch respectively. The excessive drought hastened the ripening of the grain and caused a material decrease in the yield. The straw was very short, but the grain was of good quality and yielded better than had been anticipated.

SOME Weather Observations taken at Experimental Station, Ste. Anne de la Pocatière, 1914.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	
	°	°	°	Inches.	Inches.	Inches.	Hours.
January	38·4	−30·6	12·9	·30	18·0	2·10	92·2
February	36·2	−32·6	5·9	....	13·0	1·30	104·3
March	47·0	− 3·0	24·4	·08	12·0	1·28	139·8
April	60·0	6·2	31·3	·54	5·5	1·09	174·6
May	80·4	22·0	53·4	3·18	1·0	3·28	244·4
June	81·4	32·4	56·8	·92	....	·92	235·6
July	91·4	37·2	63·6	·64	....	·64	288·2
August	89·4	34·6	60·0	1·04	....	1·04	238·8
September	82·4	31·8	50·5	2·34	....	2·34	178·6
October	66·2	30·0	47·2	3·46	1·5	3·61	112·8
November	47·0	2·0	24·4	1·19	8·0	1·99	80·8
December	45·0	−24·2	9·6	·24	6·5	·89	103·0
Total						20·48	1,993·1
Total for six growing months, April to September						9·31	1,360·2

NOTE.—Ten inches of snow equal one inch of rain.

CROP YIELDS.

The following are the yields of hay, roots, corn and oats per acre: Hay, 1 ton 650 pounds; corn, 4 tons 200 pounds; roots, 12 tons 957 pounds; oats, 31 bushels 26 pounds.

COST OF PRODUCTION.

The following table gives the yields and costs of producing corn and turnips.

Cost of Production of Corn and Turnips.

Crop.	Yield per acre.				Cost of Production.		
					Per acre.	Per ton.	Per bush.
	Tons.	Lb.	Bush.	Lb.	$ cts.	$ cts.	Cents.
Roots (Magnum Bonum)	12	957	415	57	36 39	2 94	9·73
Fodder Corn	4	200			21 97	5 36	

A separate record is herewith given of the cost of production, and yields of oats, grown on the same type of soil, but following roots and pasture, respectively. With the exception of a light dressing of manure to the hoed area, the cultural preparatory work was the same for both. The results are decidedly in favour of the crops following roots, both grain and the following hay crop yielding nearly double the quantity of higher quality hay than that grown on the area in pasture previously.

These observations, which are more striking in seasons of extreme drought, illustrate the importance of a proper sequence of crops, and thorough cultivation whereby not only the immediate crop is benefited but also those that follow.

Cost of Production of Oats.

Crop.	Yield per acre.		Cost of Production.	
			Per acre.	Per bush.
	Bush.	Lb.	$ cts.	Cents.
Oats (after hoed crop)	73	29	18 30	24 75
Oats (after pasture)	36	2	15 30	42 50

ROTATION OF CROPS.

An important work at this Station consists of experiments with rotations considered suitable for dairy farms. The object is to ascertain the relative value of the different rotations as soil improvers, as well as to compare the yields and profits. The crops included in the rotations are selected for the purpose of supplying a maximum amount of suitable food for milk production, and maintaining or increasing the fertility of the soil.

The following rotations are now under test, and as soon as the necessary work has been completed it will be possible to place the whole Station under regular rotation.

ROTATION "A" (FIVE YEARS' DURATION).

First year.—Hoed crop of corn or roots. For corn, manure applied at rate of 25 tons per acre in spring and ploughed under. After crop is harvested, land is shallow ploughed or cultivated.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice if possible.

Fourth year.—Timothy hay or pasture. Ploughed shallow in August, top-worked and re-ploughed or ridged up in late autumn.

Fifth year.—Grain. Seeded down with 10 pounds red clover which is allowed to grow to be turned under following spring, when the hoed crop is corn.

ROTATION "C" (FOUR YEARS' DURATION).

First year.—Hoed crop of corn or roots.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice if possible.

Fourth year.—Timothy hay. Field ploughed shallow in August, top-worked and re-ploughed or ridged up in late autumn.

ROTATION "D" (THREE YEARS' DURATION).

First year.—Hoed crop of corn or roots. For corn, land is manured, 15 tons per acre, and ploughed in spring; for roots it is manured and ploughed in fall.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay. Cut twice if possible.

In order to compare the results obtained in the various rotations each year, as well as one year with another, fixed values are used. These are outlined on page 182 of this report.

DESTRUCTION OF COUCH GRASS.

An old meadow with a clay soil infested with couch grass was selected for an experiment in the eradication of this persistent weed. This field, which has an area of 2 acres, was ploughed on August 13 and cross-rolled immediately afterwards. By September there was a strong growth of couch grass which was disced with the cut-away disc and left until the spring of 1914. It was then well cultivated, and it was decided to summer-fallow one-twentieth acre and to sow a smothering crop of buckwheat on the remainder. A second cultivation was given before sowing the buckwheat on June 20. The buckwheat germinated slowly but well, while the couch grass also grew apace, and on August 1 the latter was so thick that the buckwheat was smothered on the larger part of the field.

The check or summer-fallow plot was worked with the disc harrow and cultivator on June 30 and July 7, 13, 20 and 29. By August 18 this area was free from all weeds, including couch grass, on which date the whole field was ploughed, the buckwheat being in the flowering stage of its growth.

STE. ANNE DE LA POCATIERE.

Due to the drought the buckwheat was rather short, while on the other hand this weather condition aided the destruction of the couch grass on the summer-fallow area, with the result that the summer-fallow had an advantage over the smothering crop for the destruction of weeds. However, it must not be concluded that it is always superior to a smothering crop, for under other conditions the smothering crop might have controlled the weed more efficiently and, at the same time would add humus to the soil when ploughed under.

Comparing these methods of controlling couch grass to that of using hoed crops, the conclusion has been reached that the latter, well managed and included in a suitable rotation of crops, will give as satisfactory results and provide a profitable crop.

DRAINAGE.

Eighteen thousand feet of tile drains were installed during the season. These drains, composed of 3-inch tile, were laid at the average depth of 3 feet 2 inches. Several hundred feet of main drains were laid at depths varying from 5 to 6 feet in order to obtain the necessary fall.

IMPROVEMENTS.

Over 900 rods of wire fence were constructed, good cedar posts which had received two coats of paint being used. A large number of big stones were broken with dynamite, and these, together with many small ones, were removed from the various fields. Six acres of new land were stumped and partially cleared of stone during the season.

EXPERIMENTAL STATION FOR CENTRAL QUEBEC, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, G. A. LANGELIER.

THE SEASON.

The main feature about 1914 is the drought, which lasted all through July and until August 11. This cut down the yield of hay and the stock-carrying capacity of pastures very much. Corn, which is grown only for ensilage in this district, did very well and was much better than for the last three years. Carrots, mangels, and sugar beets seemed to suffer from the lack of rain in the earlier part of the season, and germination was very poor. Swedes, as is usual in this district, forged ahead during the warm days and cool nights of September and October, and the crop was a little better than usual, though bad weather increased very much the cost of lifting and storing them. The grain, with over half an inch of rain during the latter part of May, started very well, and what was sown early escaped the bad effects of the weather of middle summer. As the acreage of corn for silage and of roots is small in central Quebec, and with the very small crop of hay, it may be said that roughage will be very scarce and high in price. The last frost, 29·2°, occurred on May 17, though the thermometer fell to 32·2° on June 2, and the first one, in the autumn, was on September 29, when 27·2° was registered. The highest temperature was on August 11, 92°, and the lowest, exactly six months before, on February 11, –30·7°.

Some Weather Observations taken at Cap Rouge, 1914.

Month.	Temperature F.			Precipitation.				Total. Sunshine
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	43	−24·8	7·07	0·03	34·0	3·43	·60	57·5
February	33	−30·7	− ·84	....	32·6	3·26	·80	106·1
March	45	− 2·1	23·7	0·35	26·3	2·98	·70	125·4
April	54	6·2	30·12	1·19	6·8	1·87	·70	145·1
May	86	26·2	52·7	1·56	....	1·56	·50	239·7
June	86	32·2	56·36	3·28	....	3·28	·71	223·0
July	89	45·2	64·5	1·66	....	1·66	·58	279·8
August	92	40·2	61·9	4·43	....	4·43	·73	218·1
September	84	27·2	55·8	4·92	....	4·92	1·13	175·5
October	69	24·2	44·4	5·24	1·4	5·38	1·59	108·0
November	52	− 1·1	25·39	2·62	23·1	4·93	1·18	53·9
December	44	−22·8	13·7	0·68	19·2	2·60	·50	76·3
Total for year				25·96	143·4	40·30	....	1,808·4
Average for three years				30·82	130·3	43·85	....	1,671·4
Total for six months, May to October				21·09	1·4	21·23	....	1,244·1
Average of three years for six growing months, May to October				23·55	·5	23·60	....	1,121·2

Totals for Years 1912–14.

Rainfall. Inches.	Snowfall. Inches.	Total Precipitation. Inches.	Sunshine. Inches.
92·46	390·8	131·54	5,014·3

Total for Six Months, May to October, 1912–13–14

Rainfall. Inches.	Snowfall. Inches.	Total Precipitation. Inches.	Sunshine. Inches.
70·64	1·4	70·78	3,363·7

Cap Rouge.

CROP YIELDS.

All crops yielded above the average, with the exception of hay, which gave about 40 per cent less than usual, on account of the drought of the middle of summer.

FIELD CROPS, Areas and Yields, Cap Rouge, 1914.

Crop.	Variety.	Acreage.	Total yield.	Yield per acre.
			Lb.	
Corn	Longfellow	17 35	349,652	10 tons 153 lb.
Turnips	Good Luck	10·80	309,643	14 " 671 "
Oats	Banner	14·68	31,560	63 bush. 8 "
Wheat	Huron	1·78	3,530	33 " 3 "
Barley	Manchurian	1·96	1,975	21 " 0 "
Peas	Arthur Selected	2.69	4,075	25 " 15 "
Hay	Clover	19·37	55,019	1 ton 840 "
"	Timothy	12·03	34,717	1 " 894 "

The varieties named above are the ones which, at present, seem the best adapted to this region.

COST OF PRODUCTION OF FIELD CROPS.

Accurate records were kept of the cost of production of three of the main crops of this district, turnips, oats and hay, on 13 acres of land.

COST of Production of Field Crops, Cap Rouge, 1914.

Crop.	Variety.	Area.	Yield per acre.				Cost per ton.		Cost per bushel.
		Acres.	Tons.	Lb.	Bush.	Lb.	$	cts.	cents.
Turnips	Good Luck	3	17	1973			2	18	
Oats	Banner	3			69	29			33
Hay	Clover & Timothy	7	2	326			5	86	

In calculating the above, the values as outlined on page 182 have been used.

CAP ROUGE.

ROTATION OF CROPS.

A good rotation must not only give an immediate profit but should be a weed destroyer and an improver of fertility; in choosing it, a person will also take the one best adapted to the production of roughage and concentrates, according to his particular needs.

The following rotations, started in 1911, have been continued this year:—

ROTATION "D" (THREE YEARS' DURATION).

First year.—Swedes. Twelve tons barnyard manure per acre.

Second year.—Oats. Seeded down with 6 pounds timothy, 10 pounds red clover and 3 pounds alsike per acre.

Third year.—Hay. Cut early and again cut late if possible.

ROTATION "C" (FOUR YEARS' DURATION).

First year.—Swedes. Sixteen tons barnyard manure per acre.

Second year.—Oats. Seeded down with 12 pounds timothy, 8 pounds red clover and 2 pounds alsike per acre.

Third year.—Hay.

Fourth year.—Hay.

ROTATION "K" (SIX YEARS' DURATION).

First year.—Swedes. Twenty-four tons barnyard manure per acre.

Second year.—Oats. Seeded down with 12 pounds timothy, 8 pounds red clover and 2 pounds alsike per acre.

Third year.—Hay.

Fourth year.—Hay.

Fifth year.—Hay.

Sixth year.—Hay.

The details of costs, returns, profits or losses are given in the following tables:—

ROTATION "D"

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Horse labour (including teamster). Hours. Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
			Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
3rd...	Oats...........	Hay...........	1	7 00	S.3 32 M. 60	2	34	.5	3	......	......	......
1st...	Hay...........	Swedes........	1	7 00	S.1 30 M. 60	73	12 41	25·	29	6	......	......
2nd...	Swedes........	Oats...........	1	7 00	S.1 00 T. 25 M. 60	16	2 72	2·	16	3	......	......
	Aggregate......................		3	21 00	7 67	91	15 47	27·5	48	9	......	......
	Average per acre 1914..........		......	7 00	2 56	30·33	5 16	9·2	16	3	......	......

ROTATION "C" (Four years' duration).

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
2nd...	Swedes........	Oats...........	1	7 00	S.1·00 T. 25 M. 60	17	2 89	1	14	6	......	......
3rd...	Oats...........	Hay...........	1	7 00	S.1 63 M. 60	4	68	1·5	3	......	......	......
4th...	Hay...........	Hay...........	1	7 00	S.1 63 M. 60	4	68	1·5	3	......	......	......
1st...	Hay...........	Swedes........	1	7 00	S.1 30 M. 60	60	10 20	21	29	6	......	......
	Aggregate......................		4	28 00	8 21	85	14 45	25	49	12	......	......
	Average per acre 1914..........		......	7 00	2 05	21	3 61	6	12	3	......	......

ROTATION "K" (six years' duration).

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
6th...	Hay...........	Hay...........	1	7 00	S. 82 M. 60	2	34	·5	2	......	......	......
1st...	Hay...........	Swedes........	1	7 00	S.1 30 M. 60	74·5	12 66	24	29	6	......	......
2nd...	Swedes........	Oats...........	1	7 00	S.1 00 T. 25 M. 60	17	2 89	1	14	6	......	......
3rd...	Oats...........	Hay...........	1	7 00	S. 82 M. 60	3	51	1·5	3	......	......	......
4th...	Hay...........	Hay...........	1	7 00	S. 82 M. 60	5	85	1·5	3	......	......	......
5th...	Hay...........	Hay...........	1	7 00	S. 82 M. 60	3	51	1·5	3	......	......	......
	Aggregate......................		6	42 00	9 43	104·5	17 76	30	54	12	......	......
	Average per acre 1914..........		......	7 00	1 57	17·4	2 96	5	9	2	......	......

The cost values are the same as those enumerated on page 182 of this report. The return values are $2 per ton for turnips, 1 cent per pound for oats, $4 per ton for straw and $7 per ton for hay.

CAP ROUGE.

(three years' duration) HOED CROP—GRAIN—HAY.

IN RAISING CROPS.							PARTICULARS OF CROP.						
							WEIGHT.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Inch.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
1 15	.....	12 41	12 41	.....	20 77	.....	.....	.....	1,195	.....	4 18	4 18	− 8 23
19 07	.....	40 38	40 38	.....	1 98	.....	.....	.....	.....	40,775	40 77	40 77	39
7 21	4 38	23 16	23 16	37	.....	3 6	2,120	2,765	.....	.....	26 73	26 73	3 57
27 43	4 38	75 95	.....	.....	.....	.....	.....	.....	.....	.....	71 68	.....	.....
9 14	1 46	.....	25 32	.....	.....	.....	.....	.....	.....	.....		23 89	− 1 42

HOED CROP, GRAIN, HAY, HAY OR PASTURE.

7 49	3 06	22 29	22 29	29	.....	3·4	2,575	2,645	.....	.....	31 04	31 04	8 75
1 42	.....	11 33	11 33	.....	5 04	.....	.....	.....	4,500	.....	15 75	15 75	4 42
1 42	.....	11 33	11 33	.....	4 99	.....	.....	.....	4,540	.....	15 89	15 89	4 56
17 99	.....	37 09	37 09	.....	2 47	.....	.....	.....	.....	29,990	29 99	29 99	− 7 10
28 32	3 06	82 04	.....	.....	.....	.....	.....	.....	.....	.....	92 67	.....	.....
7 08	76	.....	20 51	.....	.....	.....	.....	.....	.....	.....	.....	23 17	2 66

HOED CROP, GRAIN, HAY, HAY, HAY OR PASTURE, HAY OR PASTURE.

82	.....	9 58	9 58	.....	7 17	.....	.....	.....	2,670	.....	9 34	9 34	− 24
18 80	.....	40 36	40 36	.....	2 17	.....	.....	.....	.....	37,155	37 15	37 15	− 3 21
7 49	3 98	23 21	23 21	32	.....	3·7	2,430	2,735	.....	.....	29 77	29 77	6 56
1 42	.....	10 35	10 35	.....	5 01	.....	.....	.....	4,130	.....	14 45	14 45	4 10
1 42	.....	10 69	10 69	.....	4 43	.....	.....	.....	4,825	.....	16 89	16 89	6 20
1 42	.....	10 35	10 35	.....	5 05	.....	.....	.....	4,095	.....	14 33	14 33	3 98
31 38	3 98	104 54	.....	.....	.....	.....	.....	.....	.....	.....	121 93	.....	.....
5 23	66	.....	17 42	.....	.....	.....	.....	.....	.....	.....	.....	20 32	2 90

ROTATIONS.—Costs, Returns, Profits or Losses, Cap Rouge, 1914.

Rotation.	Cost per acre.	Return per acre.	Profit or loss per acre.
	$ cts.	$ cts.	$ cts.
"D" (three years' duration)	25 32	23 89	1 43
"C" (four years' duration)	20 51	23 17	2 66
"K" (six years' duration)	17 42	20 32	2 90

It is too early yet to see which of the above rotations, with the fixed cost and return values set for them, will give the most profit, but the following table shows that a systematic rotation of crops will pay:—

RETURNS from Rotations "D," "C," "K," Cap Rouge, 1911-14.

	"D" 3 years.	"C" 4 years.	"K" 6 years.
	$ cts.	$ cts.	$ cts.
Returns per acre, 1914	23 89	23 17	20 32
Returns per acre, 1911	16 80	12 67	15 58
Increase in four years	7 09	10 50	4 74
Percentage of increase	42	83	30

Total cost per acre, for all three rotations, 1914............ $21 08
" " " 1911............ 21 00

It is interesting to note that the returns increased from 30 to 83 per cent, whilst the cost did not increase by 1 per cent.

PLANTING FODDER CORN IN DRILLS AND HILLS.

Since 1911, inclusively, all the corn (Longfellow) grown for silage on 39·46 acres was weighed. The following table gives details:—

CORN for Ensilage Planted in Drills and Hills, Cap Rouge, 1914.

Method of Planting.	Yield 1914.	Average Yield 4 yrs.
	Tons.	Tons.
In drills 48 inches apart, 8 inches between plants	17·62	11·58
In drills 42 inches apart, 8 inches between plants	11·95	10·76
In hills 42 inches apart	5·67	5·52
In hills, 36 inches apart	4·67	5·00
Average	10·08	8·32

CAP ROUGE.

RATES OF SEEDING OATS

Twenty-six plots of one-sixtieth acre were used in 1913 and in 1914, the experiment being duplicated for each quantity sown, which was from 1 to 4 bushels per acre, increasing by quarters of a bushel.

It is interesting to note that on sandy loam soil, in this district, a rather heavy seeding is required, as the average yield from all quantites of seed below 2½ bushels per acre is 1,681 pounds, whilst it was 2,040 pounds when the quantity of seed was over this amount.

RATES OF SEEDING CLOVER AND TIMOTHY.

In 1912 and 1913, forty-four plots of one-sixtieth acre each were used. Half of them were seeded with 12 pounds of timothy, 8 pounds of red clover and 2 pounds of alsike per acre, and the others with half of this quantity. Oats were used as a nurse crop. The full seeding gave an average of 2,191 pounds of hay per acre, and the half seeding 2,040 pounds.

YIELD OF HAY WHEN NURSE CROP IS SOWN AT DIFFERENT RATES.

In 1912 and 1913, forty-eight plots of one-sixtieth acre each were used, oats being sown at from 1 to 4 bushels per acre, increasing by quarters of a bushel, and seeded down with 12 pounds timothy, 8 pounds red clover and 2 pounds alsike per acre. The most noteworthy thing about the results is that there was 24 per cent more hay, on an average, from the plots where less than 2½ bushels of oats were used as a nurse crop than on the plots where more than this quantity was sown.

YIELD OF HAY WITH DIFFERENT NURSE CROPS.

It will be seen from the above that the heavy seeding of oats produced more grain, but less hay the following year. An experiment was started in 1912 and continued in 1913, when all the trial plots of cereals were seeded down with a mixture containing 12 pounds timothy, 8 pounds red clover, and 2 pounds alsike per acre. The following table shows that oats is not as good a nurse crop as peas, barley, or wheat:—

Kind of grain.	Number tried in 1912.	Yield of hay per acre in 1913.	Number tried in 1913.	Yield of hay per acre in 1914.	Average yield per acre for 1913 and 1914
		Lb.		Lb.	Lb.
Peas	10	4,920	6	2,650	3,785
Barley	13	4,740	7	2,057	3,398
Wheat	14	4,320	15	1,968	3,144
Oats	12	2,660	10	1,488	2,074

EXPERIMENTAL FARM FOR MANITOBA, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

THE SEASON.

The season of 1914 has been the least favourable for farm crops at Brandon for a considerable number of years. The opening of spring was about normal, and farm operations were possible on April 13. After a few days of good weather, a cold spell with some showers followed, and seeding was somewhat delayed. Some of the dryer fields were soon fit again, but others were not ready until nearly the middle of May. Following this came a period of favourable weather, and by July 1, prospects were very good. However, a dry period had set in early in June, and early in July crops began to suffer for want of moisture. Then followed a month in which the previous heat record of the Farm was far surpassed. On only six days during July did the maximum temperature not exceed 80°, and on many days it exceeded 90°. The first half of August was very similar. Combined with this heat were several spells of strong wind and a very low rainfall. The result was that crops were hastened to maturity without filling properly, and yields were reduced to about two-thirds of what indications of the first of July appeared to promise.

Threshing weather was very favourable for that operation, and the crop was harvested without loss.

The hay crop had obtained a good start during the moist weather of spring and was past injury when the heat came. A good first cutting was harvested, but there was practically no aftermath except of alfalfa and it was less than usual. New seeding of grasses and clovers did very poorly and looked like a failure at harvest time. Late rains did much to revive them, and by freeze-up a fair catch was showing.

The corn and root crop suffered much from the drought, and was much below average. Turnips were benefited by September showers, and improved greatly in the last month of growth. These showers also helped fall ploughing. A long open fall gave an unusually fine opportunity for getting farm operations finished up.

WEATHER Observations taken at Brandon Experimental Farm, 1914.

Month.	Temperature F.			Precipitation.			Heaviest in 24 hours.	Total sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.		
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	2·4	38	—37·6	....	16	1·60	·50	73·5
February	—9·9	37·9	—46·4	....	3	·30	·20	134·2
March	19·2	44·9	—20·8	....	1	·10	....	114
April	35·9	69·9	5·8	2·32	2	2·52	1·35	141·6
May	45·6	80·4	19·8	2·28	....	2·28	·94	196·1
June	57·6	88·2	31·5	2·38	....	2·38	·91	179·6
July	70·3	101·5	42·5	1·91	....	1·91	·73	267·1
August	62·5	102	29	1·02	....	1·02	·30	239
September	55·1	87	26·6	2·45	....	2·45	·71	208·9
October	47	82·5	13·5	1·54	....	1·54	·78	157·8
November	22·1	61·6	-27·8	·03	7	·73	·40	164·3
December	2·7	32·5	—31·8	....	1	·10	....	82·4
Total for year	....	....	....	13·93	30	16·93	....	1898·5
Average for ten years				13·46	46·82	18·14	....	2010·5
Total for six growing months, April to September, 1914				....	....	12·56	....	1232·3
Average of ten years for six growing months, April to September				....	....	13·12	....	1300·0

The principal farm operations were begun and finished on the following dates:—

	Began.		Finished.	
Work on land	April	13		
Seeding wheat	"	14	May	13
" oats	"	15	"	16
" flax	"	28	April	28
" barley	May	13	May	21
" clovers and grasses	April	15	"	15
" alfalfa	May	29	June	1
" corn	"	21	May	23
" field roots	"	9	"	9
Cutting alfalfa, first crop	June	23	June	30
" " second crop	July	24	August	3
" other hay crops	"	3	July	22
" wheat	August	3	August	12
" oats	"	6	"	13
" barley	July	28	"	12
" flax	August	1	"	1
" corn	September	4	September	11
Threshing	August	17	"	2
Putting corn in silo	September	11	"	15
Harvesting mangels	"	26	"	27
Harvesting turnips	October	20	October	23
Ploughing for summer-fallow	June	13	June	29
Ploughing sod	"	29	August	22
Fall ploughing (stubble)	August	25	October	24
Cultivating for summer-fallow	June	15	"	24
Cultivating and hoeing corn and roots	"	10	August	6
"Freeze-up"			November	13

BRANDON.

CROP YIELDS.

The following is the list of the field crops for 1914. This list includes the rotation fields, but not the small test plots. Pasture and summer-fallow are not included.

FIELD CROP Areas and Yields, Brandon, 1914.

Crop.	Preceding Crop.	Area.	Yield Yield.		Yield per acre.	
		Acres.	Bush.	Lb.	Bush.	Lb.
Wheat Red Fife	Summer-fallow (Rotation D.)	3·5	85	30	24	17
" Red Fife	Summer-fallow (" E)	3·5	83	30	23	43
" Red Fife	Wheat (" D)	3·5	52	..	14	54
" Red Fife	Wheat (" E)	3·5	54	..	15	43
" Red Fife	Clover (" F)	8·5	230	..	27	4
" Red Fife	Wheat (" F)	8·5	177	..	20	49
" Red Fife	Summer-fallow	6	176	..	29	20
" Red Fife	Corn. (Rotation G)	6	186	..	31	..
" Red Fife	Pasture (" H)	4·5	146	..	32	27
" Red Fife	Wheat (" H)	4·5	116	..	25	43
" Red Fife	Summer-fallow(" I)	4·5	146		32	27
" Marquis	Alfalfa (" W)	3·83	169	..	44	8
Oats Banner	Flax (" I)	4·5	265	..	58	30
" Banner	Summer-fallow (" H)	4·5	227	..	50	15
" Banner	Corn (" W)	2·72	185	..	67	22
" Banner	Peas (" Q)	5	77	..	15	14
" Banner	Brome sod, broken, and backset	2	79	..	39	17
" Banner	Oats	11·5	530	..	46	30
" Banner	Summer-fallow	1·5	89	..	59	11
Oats Daubeney	Summer-fallow	2	89	..	44	17
Barley O.A.C. No. 21	Corn (Rotation F)	5·5	153	..	27	39
" Manchurian	Corn (" F)	3	74	..	24	32
" Manchurian	Wheat (" G)	6	230	..	38	16
" Manchurian	Barley	3	90	..	30	00
" Manchurian	Corn	1	29	..	29	00
" Success	Oats (Rotation W)	2·9	48	..	16	18
Pease Arthur	Brome sod, broken, and backset	1	8	..	8	..
Flax Common	Pasture (Rotation I)	4·5	33	..	7	19
			Tons	Lb.	Tons	Lb.
Corn North Western Dent	Wheat (Rotation F)	8·5	87	985	10	586
" North Western Dent	Pasture (Rotation G)	4·5	35	725	7	1717
" North Western Dent	Wheat (Rotation W)	2·54	30	1295	12	132
Turnips Hall's Westbury	Oats (Rotation Q)	3	14	1760	4	1920
Hay Alfalfa	Alfalfa (Rotation W)	1·87	6	100	3	471
" Alfalfa	Alfalfa (" W)	2·4	9	465	3	1693
" Alfalfa	Alfalfa (" W)	2·16	8	830	3	1824
" Alfalfa	Alfalfa (" W)	1·55	5	795	3	964
" Alfalfa 1 cutting only	Alfalfa (" W)	1·4	3	1485	2	1061
" Alfalfa	Alfalfa	4	15	390	3	1598
" Alfalfa	Alfalfa new seeding	5	19	1025	3	1805
" Red clover	Barley (Rotation F)	8·5	15	1790	1	1740
" Red clover	Red clover	2·7	4	530	1	1159
" Mixed	Hay and Wheat	18	22	720	1	484
" Mixed	Hay	11	20	1840	1	1804
" Mixed	Barley (Rotation G)	6	10	..	1	1333
" Wild grass	Hay	7	4	..	..	1143
" Mixed	Oats (Rotation Q)	5	5	..	1	..
" Mixed	Hay (Rotation Q)	5	4	1580	..	1916
" Green Oats	Wheat (Rotation D)	3·5	6	..	1	1429
" Green oats	Wheat (Rotation E)	3·5	5	500	1	1000

COST OF PRODUCTION OF FIELD CROPS.

The records in connection with the experiments in rotation of crops give an excellent opportunity for obtaining information on the cost of producing the different kinds of field crops. The values used in arriving at the items of cost are those arbitrarily set for all the rotation work on the western Experimental Farms. These are given in detail in another part of this report. It will be observed that all items of cost are considered, including rent, use of machinery, and labour of both men and horses.

The four fields of wheat reported upon herewith are all on similar soil, *i.e.*, a heavy clay loam. Except for the difference entailed by the different preceding crops, these fields were handled as nearly alike as practicable. The amount of work applied was what was considered enough for good results yet not more than what was practicable and desirable.

WHEAT ON SUMMER-FALLOW.

Number of acres, 4½.
Preceding crops: Peas, oats, summer-fallow.
Items of cost:—

Rent of land, 4½ acres, 2 years at $2 per acre	$ 18 00
Ploughing previous June, man and 4 horses 15 hours at 48 cents per hour	7 20
Packing, man and 4 horses, 3½ hours at 48 cents per hour	1 68
Cultivating, man and 4 horses, 29½ hours at 48 cents per hour	14 16
Harrowing, man and 2 horses, 18 hours at 34 cents per hour	6 12
Seeding, man and 2 horses, 4½ hours at 34 cents per hour	1 53
Packing, man and 4 horses, 2½ hours at 48 cents per hour	1 20
Binding, man and 3 horses, 4½ hours at 41 cents per hour	1 86
Stooking, man, 5 hours at 19 cents per hour	95
Threshing, 146 bushels at 7 cents per bushel	10 22
Use of machinery, 4½ acres, 2 years at 60 cents per acre	5 40
Seed, 4½ acres at $1.50 per acre	6 75
Twine	3 45
Total cost for 4½ acres	$ 78 52

Total yield for 4½ acres, 146 bushels.
Yield per acre, 32 bushels, 21 pounds.
Cost per acre, $17.55.
Cost per bushel, 54 cents.

WHEAT FOLLOWING CORN.

Number of acres, 6.
Preceding crops: Oats, hay, pasture, corn.
Items of cost—

Rent, 6 acres at $2 per acre	$ 12 00
Manure, one-sixth share of 8 tons per acre at $1 per ton	8 00
Harrowing, man and 2 horses, 3 hours at 34 cents per hour	1 02
Seeding, man and 2 horses, 6 hours at 34 cents per hour	2 04
Binding, man and 3 horses, 7 hours at 41 cents per hour	2 87
Stooking, man, 12 hours at 19 cents per hour	2 28
Threshing, 186 bushels at 7 cents per bushel	13 02
Use of machinery, 6 acres at 60 cents per acre	3 60
Seed, 6 acres at $1.50 per acre	9 00
Twine	4 20
Total cost for 6 acres	58 03

Total yield for 6 acres, 186 bushels.
Yield per acre, 31 bushels.
Cost per acre, $9.67.
Cost per bushel, 31 cents.

COST OF PRODUCTION OF FIELD CROPS—*Continued.*

WHEAT FOLLOWING WHEAT.

Number of acres, 4½.
Preceding crops: Hay, pasture, wheat.
Items of cost—

Rent 4½ acres at $2 per acre	$9 00
Manure, one-sixth share of 6 tons per acre at $1 per ton	4 50
Ploughing in October, man and 4 horses, 15 hours at 48 cents per hour	7 20
Discing in spring, man and 2 horses, 9 hours at 34 cents per hour	3 06
Harrowing, man and 2 horses, 11½ hours at 34 cents per hour	3 91
Seeding, man and 2 horses, 4 hours at 34 cents per hour	1 36
Binding, man and 3 horses, 4½ hours at 41 cents per hour	1 86
Stooking, man, 5 hours at 19 cents per hour	95
Threshing, 116 bushels at 7 cents per bushel	8 12
Use of machinery, 4½ acres at 60 cents per acre	2 70
Seed, 4½ acres at $1.50 per acre	6 75
Twine	2 10
Total cost for 4½ acres	$51 51

Total yield for 4½ acres, 116 bushels.
Yield per acre, 25 bushels 43 pounds.
Cost per acre, $11.44.
Cost per bushel, 44 cents.

WHEAT ON SOD LAND.

Number of acres, 4½.
Preceding crops: Oats, hay, pasture.
Items of cost—

Rent, 4½ acres at $2 per acre	$9 00
Manure, one-sixth share of 6 tons per acre at $1 per ton	4 50
Ploughing in summer, man and 4 horses, 18 hours at 48 cents per hour	8 64
Discing, man and 2 horses, 13½ hours at 34 cents per hour	4 59
Harrowing, man and 2 horses, 5½ hours at 34 cents per hour	1 87
Seeding, man and 2 horses, 4½ hours at 34 cents per hour	1 53
Binding, man and 3 horses, 5 hours at 41 cents per hour	2 05
Stooking, man, 6 hours at 19 cents per hour	1 14
Threshing, 146 bushels at 7 cents per bushel	10 22
Use of machinery, 4½ acres at 60 cents per acre	2 70
Seed, 4½ acres at $1.50	6 75
Twine	3 30
Total cost for 4½ acres	$56 29

Total yield for 4½ acres, 146 bushels.
Yield, per acre, 32 bushels 27 pounds.
Cost, per acre, $12.51.
Cost, per bushel, 39 cents.

COST OF PRODUCING OATS.

Oats on Flax Land.

Number of acres, 4½.
Preceding crops: Hay, pasture, flax.
Items of cost—

Rent, 4½ acres at $2 per acre	$ 9 00
Manure, one-sixth share of six tons per acre at $1 per ton	4 50
Ploughing in October, man and 4 horses, 15 hours at 48 cents per hour	7 20
Discing, man and 2 horses, 9 hours at 34 cents per hour	3 06
Harrowing, man and 2 horses, 11½ hours at 34 cents per hour	3 91
Seeding, man and 2 horses, 4 hours at 34 cents per hour	1 36
Binding, man and 3 horses 3½ hours at 41 cents per hour	1 45
Stooking, man, 6 hours at 19 cents per hour	1 14
Threshing, 265 bushels at 4 cents per bushel	10 60
Use of machinery, 4½ acres at 60 cents per acre	2 70
Seed, 4½ acres at $1 per acre	4 50
Twine	2 55
Total cost for 4½ acres	$ 51 97

Total yield for 4½ acres, 265 bushels.
Yield per acre, 58 bushels, 30 pounds.
Cost per acre, $11.55.
Cost per bushel, 20 cents.

BRANDON.

COST OF PRODUCTION OF FIELD CROPS—*Continued.*

Oats on Corn Land.

Number of acres, 2·72.
Preceding crops: Wheat, summer-fallow, corn
Items of cost—

Rent, 2·72 acres at $2 per acre.. .. .. $	5 44
Raking off corn trash, man and 2 horses, 4½ hours at 34 cents per hour..	1 53
Harrowing, man and 2 horses, 3 hours at 34 cents per hour..	1 02
Seeding, man and 2 horses, 3 hours at 34 cents per hour..	1 02
Binding, man and 3 horses, 4 hours at 41 cents per hour..	1 64
Stooking, man, 6 hours at 19 cents per hour..	1 14
Threshing, 185 bushels at 4 cents per bushel..	7 40
Use of machinery, 2·72 acres at 60 cents per acre..	1 63
Seed, 2·72 acres at $1 per acre..	2 72
Twine..	1 35
Total cost for 2·72 acres.. .. .. $	24 89

Total yield for 2·72 acres, 185 bushels.
Yield per acre, 67 bushels, 22 pounds.
Cost per acre, $9.15.
Cost per bushel, 13½ cents.

COST OF PRODUCING BARLEY.

Barley suffered the most severely of any grain crop during the drought and heat. Consequently yields are lower and cost of production per bushel higher than normal.

Barley following Oats and Wheat.

Number of acres, 6.
Preceding crops: Corn, wheat, oats.
Items of cost—

Rent, 6 acres at $2 per acre.. .. .. $	12 00
Manure, one-sixth share of 8 tons per acre at $1 per ton..	8 00
Ploughing, man and 4 horses, 18 hours at 48 cents per hour.. ..	9 12
Discing and harrowing, man and 2 horses, 25 hours at 34 cents per hour..	8 50
Seeding, man and 2 horses, 6 hours at 34 cents per hour..	2 04
Binding, man and 3 horses, 7 hours at 41 cents per hour..	2 87
Stooking, man, 13 hours at 19 cents per hour..	2 47
Threshing, 230 bushels at 5 cents per bushel..	11 50
Use of machinery, 6 acres at 60 cents per acre..	3 60
Seed, 6 acres at $1 per acre..	6 00
Twine..	2 70
Total cost for 6 acres.. .. .. $	68 80

Total yield from 6 acres, 230 bushels.
Yield per acre, 38 bushels, 16 pounds.
Cost per acre, $11.47.
Cost per bushel, 30 cents.

COST OF PRODUCTION OF FIELD CROPS—*Concluded.*

COST OF PRODUCING CORN ENSILAGE.

Corn following Wheat.

Number of acres, 8½.
Preceding crops: Summer-fallow, wheat, wheat.
Items of cost—

Rent, 8½ acres at $2 per acre	$17 00
Manure, one-fifth share of 6 tons per acre at $1 per ton	10 20
Ploughing in October, man and 4 horses, 25 hours at 48 cents per hour	12 00
Discing and harrowing, man and 2 horses, 21 hours at 34 cents per hour	7 14
Rolling, man and 2 horses, 3 hours at 34 cents per hour	1 02
Seeding, man and 2 horses, 11½ hours at 34 cents per hour	3 91
Cultivating, man and 2 horses, 30 hours at 34 cents per hour	10 20
Cultivating, man and 1 horse, 31½ hours at 27 cents per hour	8 51
Hoeing, men, 204 hours at 19 cents per hour	38 76
Cutting corn, man and 2 horses, 17 hours at 34 cents per hour	5 78
Filling silo, 87½ tons at 65 cents per ton	56 88
Use of machinery, 8½ acres at 60 cents per acre	5 10
Seed, 8½ acres at 65 cents per acre	5 53
Twine	6 10
Total cost for 8½ acres	$188 13

Total yield from 8½ acres, 87½ tons.
Yield per acre, 10 tons 586 pounds.
Cost per acre, $22.13.
Cost per ton, $2.15.

COST OF PRODUCING ALFALFA HAY.

Number of acres, 2·4.
Preceding crop: Alfalfa for three previous years.
Items of cost—

Rent, 2·4 acres at $2 per acre	$4 80
One-fifth share of rent and labour of seed-down season	4 80
Cutting and raking, man and 2 horses, 3 hours at 34 cents per hour.	1 02
Tedding, man and 1 horse, 2 hours at 27 cents per hour	54
Coiling, man, 7 hours at 19 cents per hour	1 33
Drawing in, man and 2 horses, 16½ hours at 34 cents per hour	5 61
Loading and unloading, men, 15 hours at 19 cents per hour	2 85
Cutting and raking second crop, man and 2 horses, 4 hours at 34 cents per hour	1 36
Tedding, man and one horse, 2 hours at 27 cents per hour	54
Coiling and shaking out, men, 9 hours at 19 cents per hour	1 71
Drawing in, man and 2 horses, 5 hours at 34 cents per hour	1 70
Loading and unloading, men, 4 hours at 19 cents per hour	76
Use of machinery, 2·4 acres at 60 cents per acre	1 44
Seed, one-fifth share of seed used in 1910	2 88
Total cost for 2·4 acres	$31 34

Total yield from 2·4 acres, 9 tons, 465 pounds.
Yield per acre, 3 tons, 1,693 pounds.
Cost per acre, $13.06.
Cost per ton, $3.39.

ROTATION OF CROPS.

There is a growing sentiment in the province of Manitoba in favour of increasing the number of live stock kept, growing more forage crops, and thus going in for that system of agriculture known as mixed farming. This province has long been known as a grain-growing country. It seemed specially adapted to that purpose; the great fertility of the soil, the ease with which large areas could be cultivated, and the quality of the grain produced, all tended to make wheat production the mainstay of prairie farming. Thirty years of that method have begun to bring about the inevitable result. Weeds are becoming more prevalent, fertility is beginning to fail, and soil blowing is becoming more of a difficulty each year. These difficulties are more perceptible on some farms than on others, depending on how well the land has been farmed.

The very essence of the advantage of mixed farming is that it makes possible a more scientific rotation of crops than can be practised under grain growing. By caus-

ing the various crops to follow each other in the most desirable sequence, it is possible that the fertility and cleanliness of the land may be kept up, and that each crop may leave the land in a suitable condition for its successor. In order to get definite information as to what rotations are suited to Manitoban conditions, eight different rotations are under test at this Experimental Farm.

That the results obtained in various years may be comparable, fixed valuations have been established for both labour and product. These valuations will be used from year to year, regardless of fluctuations in rates of wages and values of products. Thus in some seasons, such as 1914, the actual profits will really be greater than are shown; in others, when prices for products are low, the profits will be less. These constant values, however, permit of a fairer comparison of the different rotations, and of periods of years within a single rotation.

The following values have been fixed:—

Return Values.

Wheat (from the machine)	per lb.	1½ cents.
Barley "	"	1 cent.
Oats "	"	1 cent.
Peas "	"	1½ cents.
Flax "	"	3 cents.
Timothy hay	per ton.	$ 10 00
Red Clover hay	"	10 00
Alfalfa hay	"	12 00
Brome Grass hay	"	10 00
Western Rye Grass hay	"	10 00
Mixed hay	"	10 00
Green hay	"	10 00
Oat straw	"	2 00
Flax straw	"	2 00
Barley straw	"	2 00
Wheat straw	"	1 00
Pea straw	"	2 00
Dry corn stalks	"	5 00
Corn ensilage	"	3 00
Mangels and turnips	"	3 00
Sugar beets	"	4 00
Pasture, each horse	per month.	1 00
" cow	"	1 00
" sheep	"	25

Cost Values.

Rent	per acre.	$2 00
Barnyard manure spread on fields (charged equally over all years of the rotation)	per ton.	1 00
Seed wheat	per acre.	1 50
Seed oats	"	1 00
Seed barley	"	1 00

(All other seeds to be charged at actual cost. Cost of grass seed to be charged equally on the years producing grass. Twine charged at actual cost.)

Machinery	per acre.	·60
Manual labour	per hour.	·19
Horse labour (including teamster)—		
Single horse	per hour.	·27
Two-horse team	"	·34
Three-horse	"	·41
Four-horse team	"	·48
Additional horses	each hour.	·07

(Work done by traction engine is to be converted into the amount of horse labour required to do the work, and charged accordingly.)

Threshing (covering work from stook to granary)—		
Wheat	per bush.	·07
Oats	"	·04
Barley	"	·05
Flax	"	·12
Peas	"	·07

The eight crop rotations under test at this farm have all been under full operation this year, and interesting results have been obtained.

BRANDON.

ROTATION "D" (FOUR YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat, manured preceding fall at the rate of 6 tons per acre.

Third year.—Oats.

Fourth year.—Summer-fallow.

This is a typical grain-farming rotation, except that manure is applied every four years. The first crop of wheat is sown on summer-fallowed land. After the crop is harvested the land is manured in the fall and then ploughed. A second crop of wheat is then sown. The stubble is ploughed in the fall, if possible, and a crop of oats is grown the following year. The land is summer-fallowed in the fourth year, in preparation for wheat again. The soil on which this rotation is located is a black loam, varying from clayey to sandy. Operations were commenced on this rotation in 1910, and it has been in full operation ever since.

ROTATION "E" (FOUR YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Oats.

Fourth year.—Summer-fallow.

This is identically the same rotation as "D," except that no manure is applied at any time. It is the same rotation as used by many of the best grain farmers in Manitoba. The operations have been exactly the same as on "D," except for the application of manure. The land is the same as "D," each field lying contiguous to the corresponding field in "D."

One striking result already observed in rotations "D" and "E" is the great difficulty in keeping wild oats in check. The three successive grain crops give this weed a great opportunity to multiply, and the summer-fallow is not a sufficient means of checking it. This result coincides with the experience of many Manitoba farmers who find that in growing grain exclusively, the wild oats increase from year to year no matter how well the summer-fallowing is done. In the mixed-farming rotations under operation nearby, this difficulty is not experienced. In order to control the wild oats better, the oats in rotations "D" and "E" were cut for green hay this year. The results from these rotations are given in detail in the accompanying table.

ROTATION "F" (FIVE YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Corn or roots. Manured preceding fall.

Fourth year.—Oats or barley. Seeded with grass and clover.

Fifth year.—Clover hay.

Five fields of 8½ acres each are used for this rotation. After the first crop of wheat, the land is manured and fall ploughed for corn, which is kept well cultivated during the season. The barley and grass seed are sown next spring without ploughing.

As soon as the crop of hay is cut in the fifth year the land is ploughed up and given a partial summer-fallow for the balance of the season. It is then in first-class condition for the wheat of the first year.

Rotation "F" is a mixed-farming rotation suited to conditions where it is desired to grow both a considerable quantity of wheat and a large quantity of fodder for stock. It pre-supposes a sufficient area of permanent pasture outside the rotation. It eliminates the summer-fallow.

This rotation is proving a decided success on the Experimental Farm. In a country where summer-fallowing is generally considered essential, it demonstrates the possibility of producing a profitable crop every year. The substitutes for the summer-fallow are: first, corn or roots; and, secondly, clover hay. While these crops do not show in themselves any very great profit, they more than pay for the operations they involve, and for the overhead charges counted against them, and they leave the land in such a condition that the following crops of grain are more profitable than any grown in the straight grain-growing rotation. The detailed results on rotation "F" for 1914 are shown in the accompanying table.

ROTATION "G" (SIX YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Oats and barley. Seeded with grass and clover.

Fourth year.—Clover hay.

Fifth year.—Pasture.

Sixth year.—Corn or roots. Manured previous fall.

This is a mixed-farming rotation which provides for one-third of the farm in wheat, and gives a good area to different kinds of feed for live stock, including pasture. The latter necessitates the building of divisional fences between the fields.

The wheat of the first year is sown among the stubble of the corn of the sixth year, without ploughing. The trash from the corn is raked off and burned, and the land harrowed. After the first crop of wheat is harvested the land is fall ploughed for a second crop. After the second crop, it is again fall ploughed. The third crop is oats or barley, and with it is sown a mixture of 5 pounds of timothy and 8 pounds of red clover, per acre. The fourth year, there is a crop of hay, mostly clover. As soon as it is removed, the aftermath is used for pasture. The fifth year is pasture, up till about the middle of July or the first of August, when the aftermath of the hay field is ready to carry the stock. The pasture is then manured, and ploughed under. There having been only two years of grass, the sod is not hard to plough, and does not need to be backset. The sixth year is corn or roots. These are thoroughly cultivated, so that the land is left as clean as a good summer-fallow, and is ready for wheat again, without ploughing.

The land used for rotation "G" is a heavy clay loam. This rotation was the first started on the Farm, and has been in full operation several years. The results for 1914 are shown in detailed form in the accompanying table.

ROTATION "H" (SIX YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Summer-fallow.

Fourth year.—Oats. Seeded with grass and clover.

Fifth year.—Hay.

Sixth year.—Pasture. Manured in midsummer.

BRANDON.

This is a mixed-farming rotation, suitable for those who do not wish to grow corn or roots on a large scale. It gives one-third of the land to wheat, and one-sixth each to oats, hay and pasture. It requires divisional fences on account of the pasture. The rotation is located on heavy clay land. The land has been somewhat badly infested with couch grass, but it is now more nearly comparable with the rest of the Farm.

The first crop of wheat is sown on the sod land which has been broken the previous midsummer and manured. After fall ploughing, a second crop of wheat is sown. Then the land is summer-fallowed. Following the summer-fallow, oats are sown, and with them a mixture of grass and clover. After one year of hay and one of pasture the land is broken again for wheat, as at the first.

The detailed results from this rotation are given in the accompanying table.

ROTATION "I" (SIX YEARS' DURATION).

First year.—Flax.

Second year.—Oats.

Third year.—Summer-fallow.

Fourth year.—Wheat. Seeded with grass and clover.

Fifth year.—Hay.

Sixth year.—Pasture. Manured in midsummer.

This rotation is very similar to "H," the difference being that one crop of wheat is replaced by flax, and the position of the other crop of wheat is changed with the oats, so that the seeding down is with wheat. It occupies half of the same fields as occupied by "H," and is under the same disadvantage as regards couch grass. The results are reported in tabular form with the others.

ROTATION "Q" (EIGHT YEARS' DURATION).

First year.—Roots and peas.

Second year.—Wheat or oats. Seeded with grass and clover.

Third year.—Hay.

Fourth year.—Hay.

Fifth year.—Pasture.

Sixth year.—Pasture.

Seventh year.—Pasture.

Eighth year.—Green feed and rape. Manured in fall.

This rotation is located on a piece of poor, gravelly soil, on the high land at the rear of the Experimental Farm. It is used as a sheep farm, and the rotation is arranged accordingly. The first year is divided between peas and turnips. They are sown on land that grew green feed and rape the year before, and was manured and fall ploughed. The next year, the field is seeded down, with oats or wheat as a nurse crop. Two years of hay and three of pasture follow. In the last year of pasture, the land is ploughed in midsummer, and backset the following spring. A crop of green feed (peas and oats), and a crop of rape for pasture, are grown the last year. The land is then manured, and ploughed for the first year crops again.

BRANDON.

ROTATION "W" (TEN YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Corn or roots. Manured.

Fourth year.—Oats.

Fifth year.—Barley.

Sixth year.—Alfalfa. Sown alone.

Seventh year.—Alfalfa.

Eighth year.—Alfalfa.

Ninth year.—Alfalfa.

Tenth year.—Alfalfa. Ploughed up in midsummer.

This is distinctly an alfalfa rotation. For the use of this crop it is necessary to have a long rotation, as the alfalfa is expensive to seed, and takes some time to reach its highest production. This rotation will be best suited to a dairy or stock farm, as half the land is under alfalfa.

The soil on which rotation "W" is used is heavy clay. The first year, wheat is sown on land upon which alfalfa has been grown for four years, and has been ploughed in midsummer after the first cutting of the last year of alfalfa has been taken off. After fall ploughing, another crop of wheat is taken off. The land is then heavily manured, and sown to corn or roots. Following the hoed crop, oats are sown, without ploughing. Following the oats, a crop of early-maturing barley is grown, and the land given a partial summer-fallow, either before the barley is sown or after it comes off. The next year, alfalfa is sown without a nurse crop. Three full years of alfalfa hay, and a first cutting of the fourth year are harvested. The land is then ploughed in midsummer, and made ready for wheat again.

This rotation is in full swing this year for the first time, and has made a remarkably good showing, as given in detail herewith.

BRANDON.

ROTATION "D"

Rotation Year.	Crops.		Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour: Hours manual labour.	Cost of manual labour.	Horse labour (including teamster). Hours: Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
	1913.	1914.	Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st....	Fallow........	Wheat.........	3·5	12 25	9 10	4	0 76	......	5½	4	2½	......
2nd...	Wheat........	Wheat.........	3·5	12 25	7 88	2½	0 48	......	11	3	11	......
3rd....	Wheat........	Oats...........	3·5	12 25	5 60	26	4 94	......	25	......	16½	......
4th....	Oats..........	Fallow.........	3·5	12 25	2 10	......	......	......	7½	......	20	......
	Aggregate.....................		14	49 00	24 68	32½	6 18	......	49	7	50	......
	Average per acre..............		......	3 50	1 76	......	0 44	......	......	......	......	......

ROTATION "E"

Rotation Year.	1913.	1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Hours manual labour.	Cost of manual labour.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st....	Fallow........	Wheat.........	3·5	7 00	8 92	4	0 76	......	5½	4	2½	......
2nd...	Wheat........	Wheat.........	3·5	7 00	8 23	2½	0 48	......	11	3	11	......
3rd....	Wheat........	Oats...........	3·5	7 00	5 60	26	4·94	......	25	......	16½	......
4th....	Oats..........	Fa low.........	3·5	7 00	2 10	......	......	......	7½	......	20	......
	Aggregate.....................		14	28 00	24 85	32½	6 18	......	49	7	50	......
	Average per acre..............		......	2 00	1 77	......	0 44	......	......	......	......	......

ROTATION "F"

Rotation Year.	1913.	1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Hours manual labour.	Cost of manual labour.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st....	Clover........	Wheat.........	8·5	30 60	31 45	15	2 85	......	47½	9	38	......
2nd...	Wheat........	Wheat.........	8·5	17 00	22 80	13	2 47	......	22	9	25	......
3rd....	Wheat........	Corn...........	8·5	27 20	16 73	204	38 76	31½	82½	......	25	......
4th....	Corn..........	Barley.........	8·5	30 60	16 60	10	1 90	......	26½	8	......	......
5th....	Barley........	Clover.........	8·5	30 60	31 66	56	10 64	6	52	......	......	......
	Aggregate.....................		42·5	136 00	119 24	298	56 62	37½	230½	26	88	......
	Average per acre..............		......	3 20	2 81	......	1 33	......	......	......	......	......

ROTATION "G"

Rotation Year.	1913.	1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Hours manual labour.	Cost of manual labour.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st....	Corn..........	Wheat.........	6	20 00	16 80	12	2 28	......	9	7	......	......
2nd...	(No crop).....	Wheat.........	6	20 00	18 00	13	2 47	......	15	7	......	......
3rd....	Oats..........	Barley.........	6	20 00	12 30	13	2 47	......	31	7	19	......
4th....	Barley........	Clover hay.....	6	20 00	11 58	46	8 74	......	27½	......	......	......
5th....	Clover hay...	Pasture........	6	12 00	14 55	23	4 37	......	17	......	......	......
6th....	Pasture.......	Corn...........	6	20 00	9 60	250	47 50	18	80	......	30	......
	Aggregate.....................		36	112 00	82 83	357	67 83	18	179½	21	49	......
	Average per acre..............		......	3 11	2 30	......	1 89	......	......	......	......	......

BRANDON.

(four years' duration).

in raising Crop.							Particulars of Crop.						
							Weight.						
Value of horse labour.	Cost of threshing or silo filling.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
4 71	5 99	32 81	9 37	0 78	....	....	5,130	10,000	....	....	73 40	20 97	11 60
10 25	3 64	34 50	9 86	0 66	....	....	3,120	3,000	....	....	43 10	12 31	2 45
16 42	....	39 21	11 20	....	6 53	....	....	....	12,000	....	60 00	17 1[illegible]	5 49
12 15	....	26 50	7 57	....	....	....	....	....	....	....	....	....	−7 57
43 53	9 63	133 02	....	....	....	....	....	....	....	....	176 50	....	....
3 11	0 69	....	9 50	....	....	....	....	....	....	....	....	12 61	3 11

(four years' duration).

Value of horse labour.	Cost of threshing or silo filling.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
4 71	5 87	27 24	7 78	0 69	....	....	5,010	9,000	....	....	71 30	20 37	12 59
10 25	3 74	29 74	8 50	0 55	....	....	3,240	5,000	....	....	45 70	13 06	4 56
16 41	....	33 96	9 70	....	6 47	....	....	....	10,500	....	52 50	15 00	5 30
12 15	....	21 25	6 07	....	....	....	....	....	....	....	....	....	−6 07
43 53	9 63	112 19	....	....	....	....	....	....	....	....	169 50	....	
3 11	0 69	....	8 01	....	....	....	....	....	....	....	....	12 11	4 10

(five years' duration).

Value of horse labour.	Cost of threshing or silo filling.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
38 08	16 10	119 08	14 01	0 52	....	....	13,800	31,000	....	....	199 50	23 47	9 46
23 17	12 3	77 83	9 15	0 44	....	....	10,620	20,000	....	....	151 60	17 83	8 68
48 56	56 88	188 13	22 13	....	2 15	....	....	....	....	175,000	262 5	30 88	8 75
12 29	11 35	72 74	8 56	0 32	....	....	10,896	14,000	....	....	122 96	14 47	5 91
19 30		92 20	10 85		5 80	....	....	....	31,790		158 95	18 70	7 85
141 40	96 72	549 98			....	....	....	....			895 51		
3 33	2 28		12 93	....	....	....						21 07	8 13

(six years' duration).

Value of horse labour.	Cost of threshing or silo filling.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
5 93	13 02	58 03	9 67	0 31	....	....	11,160	18,000	....	....	157 80	26 30	16 63
7 97	12 32	60 76	10 13		....	....	10,560	26,000	....	....	153 80	25 63	15 50
22 53	11 50	68 80	11 47	0 30			11,040	12,000			132 40	22 07	10 60
9 35		49 67	8 28		4 97				20,000		112 00	18 67	10 39
5 78		36 70	6 12						14,000		94 00	15 67	9 56
46 46	22 97	146 53	24 42		4 14					70,725	106 09	17 68	−6 74
98 02	59 81	420 49									756 09		
2 72	1 66		11 6[illegible]									21 00	9 32

Brandon.

ROTATION "H"

Rotation year.	Crops. 1913.	Crops. 1914.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour: Hours.	Manual labour: Cost.	Horse labour (including teamster). Hours: Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
			Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st....	Pasture.......	Wheat.........	4·5	13 50	12 75	6	1 14	......	23½	5	18	......
2nd...	Wheat.........	Wheat.........	4·5	13 50	11 55	5	0 95	......	24½	4½	15	......
3rd....	(Barley)......	Fallow.........	4·5	13 50	2 70	......	......	......	17	......	39	......
4th....	Fallow........	Oats..........	4·5	9 00	9 90	6	1 14	......	22½	4½	2½	......
5th....	(No crop).....	Hay...........	4·5	9 00	2 70	8	1 52	......	7	......	......	......
6th....	Hay...........	Pasture........	4·5	9 00	7 65	......	......	......	......	......	......	......
	Aggregate.....................		27	67 50	47 25	25	75	......	94½	14	94½	......
	Average per acre..............		......	2 50	1 75	......	0 18	......	......	......	......	......

ROTATION "I"

Rotation year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour: Hours.	Manual labour: Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st....	Pasture.......	Flax...........	4·5	13 50	8 95	7	1 33	......	27½	......	18	......
2nd...	Flax..........	Oats...........	4·5	13 50	9 75	6	1 14	......	24½	3½	15	......
3rd....	Oats..........	Fallow..........	4·5	13 50	2 70	......	......	......	17	......	39	......
4th....	Fallow........	Wheat.........	4·5	9 00	12 90	5	0 95	......	22½	4½	2½	......
5th....	(No crop).....	Hay...........	4·5	9 00	2 70	8	1 52	......	7	......	......	......
6th....	Hay...........	Pasture........	4·5	9 00	7 65	......	......	......	......	......	......	......
	Aggregate.....................		27	67 50	44 65	26	4 94	......	98½	8	74½	......
	Average per acre..............		......	2 50	1 65	......	0 18	......	......	......	......	......

ROTATION "Q"

Rotation year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour: Hours.	Manual labour: Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st....	Oats and rape	Turnips and fallow........	5	20 00	9 00	316	60 04	23½	38	......	26½	......
2nd...	Turnips & peas	Oats...........	5	20 00	8 90	4	0 76	......	11	4	10	......
3rd....	Oats..........	Hay...........	5	20 00	7 54	20	3 80	......	16	......	......	......
4th....	Hay...........	Hay...........	5	20 00	6 98	12	2 28	......	13	......	......	......
5th....	Hay...........	Pasture........	5	10 00	......	......	......	......	......	......	......	......
6th....	Pasture.......	Pasture........	5	10 00	......	......	......	......	......	......	......	......
7th....	Pasture.......	Pasture........	5	10 00	......	......	......	......	......	......	......	......
8th....	Pasture.......	Green feed and rape..........	5	10 00	8 00	......	......	......	56½	......	14	......
	Aggregate.....................		40	120 00	40 42	352	66 88	23½	134½	4	50½	......
	Average per acre..............		......	3 00	1 01	......	1 67	......	......	......	......	......

ROTATION "W"

Rotation year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour: Hours.	Manual labour: Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
1st....	Alfalfa	Wheat	1 73	3 46	4 99	5	0 95	......	11½	13	8½	......
2nd...	(Alfalfa)......	Wheat	2 10	4 20	6 21	6	1 14	......	11½	13½	8½	......
3rd....	Wheat.........	Corn...........	2 54	8 13	4 97	225	42 75	4½	24½	......	10	......
4th....	Corn..........	Oats...........	2 72	5 44	5 70	6	1 14	......	10½	4	......	......
5th....	Oats..........	Barley.........	2 90	5 80	4 09	6	1 14	......	6	7	......	......
6th....	(Alfalfa)......	(Alfalfa).......	1 87	3 74	3 36	19	3 61	2½	18	......	......	......
7th....	Alfalfa........	Alfalfa.........	2 40	4 80	4 32	35	6 65	4	28½	......	......	......
8th....	Alfalfa	Alfalfa.........	2 16	4 32	3 88	26½	5 04	3½	25½	......	......	......
9th....	Alfalfa	Alfalfa.........	1 55	3 10	2 79	22	4 18	2½	19	......	......	......
10th..	Alfalfa........	Alfalfa.........	1 40	2 80	1 68	13	2 47	1½	12	......	......	......
			21 37	45 79	41 99	363½	69 07	18½	167	37½	27	......
			......	2 14	1 97	......	3 23	......	......	......	......	......

BRANDON.

(six years' duration).

in raising Crop.							Particulars of Crop.						
							Weight.						
Value of horse labour.	Cost of threshing or silo filling.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
18 69	10 22	56 29	12 51	0 39			8,760	1,400			123 80	27 51	15 00
17 39	8 12	51 51	11 44	0 44			6,960	1,000			97 80	21 73	10 29
24 50		40 70	9 04										−9 04
10 71	9 08	39 83	8 80	0 33			7,718	1,300			90 18	20 04	11 24
2 38		15 60	3 47		7 80				4,000		26 00	5 78	2 31
		16 65	3 70								24 00	5 33	1 63
73 66	27 42	220 58									361 78		
2 72	1 02		8 17									13 40	5 23

(six years' duration).

17 99	3 96	45 73	10 16	1 39			1,848	5,000			60 44	13 43	3 27
16 98	10 60	51 97	11 55	0 20			9,010	10,000			100 10	22 25	10 70
24 50		40 70	9 04										−9 04
10 71	10 22	43 78	9 73	0 54			8,760	15,000			124 30	27 62	17 89
2 38		15 60	3 47		7 80				4,000		26 00	5 78	2 31
		16 65	3 70								24 00	5 33	1 63
72 56	24 78	214 43									334 84		
2 69	0 92		7 94									12 40	4 46

(eight years' duration).

31 99		121 03	24 21							28,760	44 40	8 88	−15 33
10 18	3 16	43 00	8 60	0 54			2,686	4,000			30 86	6 17	−2 43
5 44		36 78	7 36		7 36				10,000		50 00	10 00	2 64
4 42		33 68	6 74		7 03				9,580		51 48	10 30	3 56
		10 00	2 00								17 25	3 45	1 45
		10 00	2 00								17 25	3 45	1 45
		10 00	2 00								15 00	3 00	1 00
25 93		43 93	8 79								35 00	7 00	−1 79
77 96	3 16	308 42									261 24		
1 95	0 08		7 71									6 53	−1 18

(ten years' duration).

13 22	5 32	28 04	16 21	0 37			4,560	6,000			63 80	36 88	20 67
13 54	6 51	31 60	15 05	0 34			5,580	9,000			78 90	37 57	22 52
14 35	19 91	90 11	35 48		2 94					61,275	91 91	36 19	0 71
5 21	7 40	24 89	9 15	0 13½			6,290	6,000			68 90	25 33	16 18
7 04	2 40	20 47	7 06	0 43			2,306	3,000			26 04	8 98	1 92
6 80		17 51	9 36		3 51				12,100		72 60	38 82	29 46
10 77		26 54	11 06		3 39				18,465		110 79	46 16	35 10
9 62		22 86	10 58		3 39				16,830		100 98	46 75	36 17
7 14		17 21	11 10		3 77				10,795		64 77	41 78	30 68
4 71		11 66	8 33		3 77				7,485		44 91	32 08	23 75
92 50	41 54	290 89									723 60		
4 33	1 94		13 61									33 86	20 25

Brandon.

CULTURAL EXPERIMENTS.

A comprehensive system of experiments for the purpose of investigating problems in regard to the cultivation of the soil has been inaugurated at this Farm. The plots were surveyed in 1911, and a start made at experimental work that year. The work has been continued each year since that time. Unfortunately, very little of a definite nature has been obtained in the way of results. In order to show the scope of the work being done, and to draw some few conclusions, the results obtained this year, and the averages, are presented herewith. However, these figures are not intended to be taken as definite proof of anything until a larger number of years' work has been averaged up.

DEPTH OF PLOUGHING.

In this experiment, summer-fallow ploughing was done at various depths, the land was then sown to wheat, and after the wheat to oats. The depth of ploughing of the wheat stubble for oats was the same as the depth of ploughing the summer-fallow, where the latter was less than 6 inches. Where the summer-fallow ploughing was 6 inches or more, the stubble ploughing which followed was uniformly 5 inches. The other treatment given was what was considered necessary for good cultivation, and was uniform throughout.

DEPTH of Ploughing Summer-fallow to be sown to Wheat followed by Oats.

Plot No.	Depth of Ploughing Summer-Fallow.	Yield of Wheat after Summer-fallow.				Yield of Oats second season after Summer-fallow.			
		1914.		3-year Average.		1914.		2-year Average.	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1	Ploughing 3 inches deep	46	10	50	30	92	2	93	33
2	Ploughing 4 inches deep	47	10	50	10	92	2	93	23
3	Ploughing 5 inches deep	46	40	47	43	90	10	95	
4	Ploughing 6 inches deep	47	10	48	07	93	08	96	01
5	Ploughing 7 inches deep	44	50	47	10	92	2	95	15
6	Ploughing 8 inches deep	45	50	49	53	95	10	92	32
7	Ploughing 5 inches deep, subsoil 4 inches	44	50	44	20	92	22	97	32
8	Ploughing 6 inches deep, subsoil 4 inches	45	30	44	30	96	16	99	4
9	Ploughing 7 inches deep, subsoil 4 inches	44	30	46	43	90	30	95	
10	Ploughing 8 inches deep, subsoil 4 inches	46	10	42	57	91	16	92	32

No difference was observed in the date of ripening of the various plots.

It is impossible to draw any conclusion from the yields obtained. About the only consistent result is the smaller yield of wheat obtained where the land had been subsoiled. Despite the lack of proof, deep ploughing is still believed to be the best, and it is probably due to deep ploughing in previous years that shallow ploughing does not have a more injurious effect.

DEPTH OF PLOUGHING SOD.

This experiment is to try different depths of ploughing sod of tame grasses and clovers. The sod used is a mixture of timothy, western rye grass, red clover and alfalfa. The ploughing is done in midsummer as soon as the hay has been harvested. The next spring wheat is sown. After the wheat is harvested the land is ploughed again according to the depths specified, and the next year oats are grown.

BRANDON.

DEPTH of Ploughing Sod to be Sown to Wheat followed by Oats.

Plot No.	Depth of Ploughing.	Yield of Wheat on Sod Land.		Yield of Oats following Wheat.	
		Bush.	Lb.	Bush.	Lb.
11	Ploughing 3 inches deep, sod and stubble	38	20	78	18
12	Ploughing 4 inches deep, sod and stubble	44	20	83	8
13	Ploughing 5 inches deep, sod and stubble	47		86	6
14	Ploughing 3 inches deep on sod and 6 inches deep after wheat	44	50	89	14

The grasses, and especially the alfalfa, were killed more effectively by the 5-inch ploughing than by the shallower. No difference was observed in date of ripening. The yields, in so far as one season proves anything, are in favour of the deeper ploughing.

SUMMER-FALLOW TREATMENT.

In this experiment, seventeen methods of handling summer-fallow are tested. In all such cases, such additional cultivation was given as seemed necessary to keep down the weeds and preserve a surface mulch. In order to present the experiment more clearly, the plots are reported in groups:—

PLOUGHING Once *versus* Twice.

Plot No.	Treatment Given.	Yield of Wheat on Summer-Fallow.				Yield of Oats Second Season.			
		1914.		Average of 3 years.		1914.		Average of 3 years.	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1	Plough 4 inches June, pack if necessary and practicable, cultivate as necessary	40	10	41	37	90	10	73	15
2	Plough 6 inches June, pack if necessary and practicable, cultivate as necessary	43	10	44	23	86	16	78	11
3	Plough 8 inches June, pack if necessary and practicable, cultivate as necessary	43	40	44	43	87	12	78	31
4	Plough 4 inches June, cultivate. Plough 4 inches September, harrow	43	30	43	40	87	12	77	2
5	Plough 6 inches June, cultivate. Plough 6 inches September, harrow	42	40	44	30	83	18	78	18
6	Plough 8 inches June, cultivate. Plough 8 inches September, harrow	43	10	42	13	83	28	74	17
7	Plough 6 inches June, cultivate. Plough 4 inches September, harrow	45	30	44	27	96	16	78	15
8	Plough 4 inches June, cultivate. Plough 6 inches September, harrow	43	40	40	40	81	6	76	15
9	Plough 4 inches June, early as possible, cultivate.								
10	Plough 6 inches September, leave untouched	41	10	41	30	52	12	71	26
	Average of 3 plots ploughed once			43	34			76	27
	Average of 6 plots ploughed twice			42	50			76	4

BRANDON.

This is evidence towards the belief that under ordinary circumstances one ploughing is quite as good as two for summer-fallow, provided the land is kept clean by surface cultivation. The plots that were ploughed only once had a slight advantage in earliness.

DATE of Ploughing.

Plot No.	Treatment given.	Yield of Wheat on Summer-Fallow. 1914.		Average of 3 years.		Yield of Oats Second Season. 1914.		Average of 2 years.	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
11	Plough 6 inches May 15, harrow and pack if necessary, cultivate as necessary	44	40	46	27	74	14	98	23
12	Plough 6 inches June 15, harrow and pack if necessary, cultivate as necessary	42	40	44	37	73	8	95	5
13	Plough 6 inches July 15, harrow and pack if necessary, cultivate as necessary	42	50	44	3	75	30	95	15

It is rather disappointing that the showing in favour of the early ploughing is not more conclusive. This is probably due to the fact that in recent years the usual June rains were not forthcoming. Rains came mostly late in the season, and as a result were conserved as well by late as by early ploughing.

A result that does not show in the table is the effect on weeds. Weeds were quite bad in the July-ploughed land, and were kept under control by the earlier ploughings. Then the weeds were hand pulled, which no doubt helped the crop on July ploughing to make a better showing than it would have done had the weeds been allowed to grow.

PASTURE *versus* Cultivation.

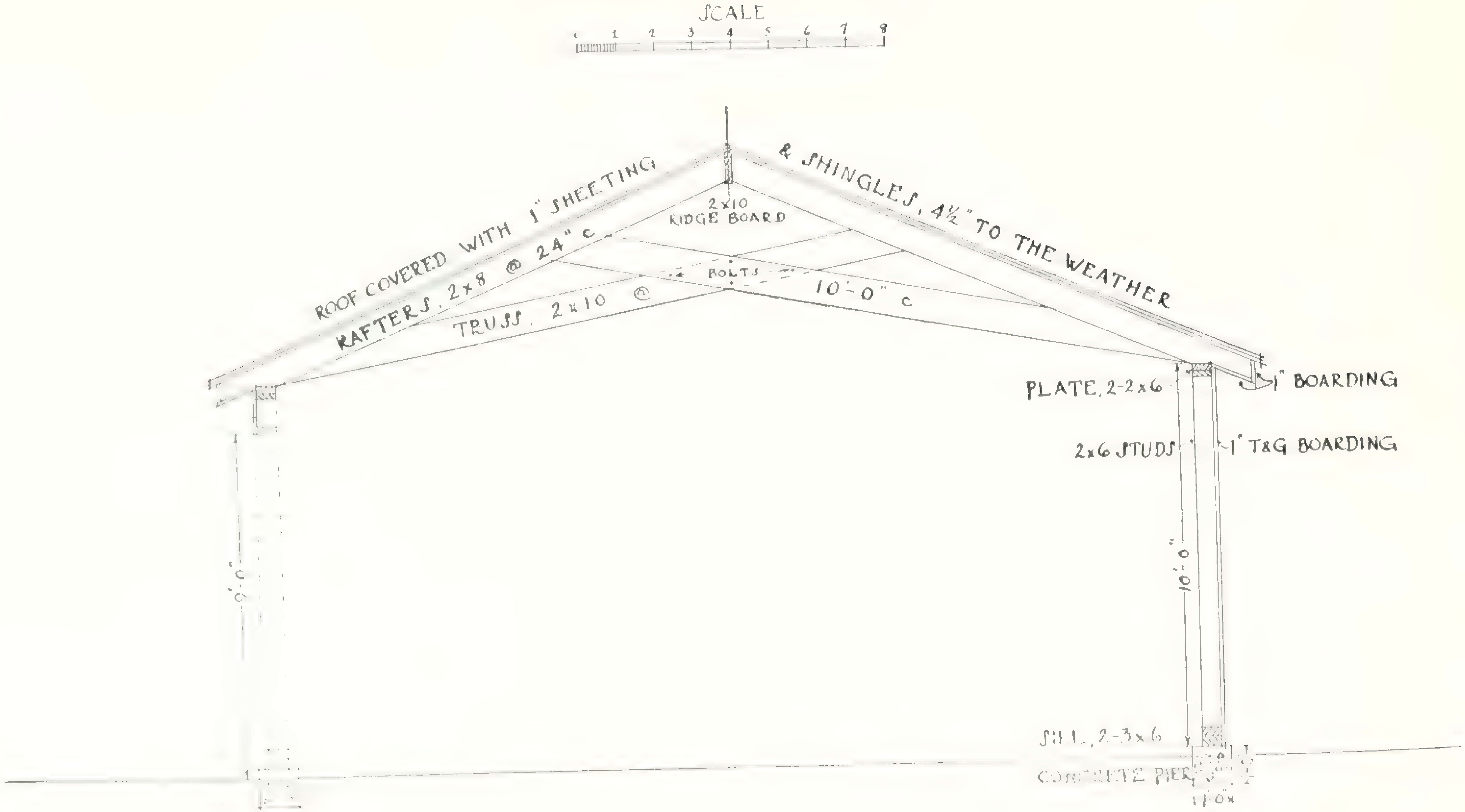
Plot No.	Treatment given.	Yield of Wheat on Summer-Fallow. 1914.		Average of 3 years.		Yield of Oats Second Season. 1914.		Average of 2 years.	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
10	Plough 5 inches June, seed to rape or other green forage crop and pasture off	38	40	41	10	89	4	101	1
11	Plough 6 inches June 15th, harrow and pack if necessary, cultivate as necessary	42	40	44	37	73	8	95	5

It is interesting to note that while the yield of wheat has been uniformly lower on the land that has been sown to rape and pastured than on the cultivated land, the yield of oats the following year is considerably higher. The control of weeds is more difficult on the rape land than where bare cultivation was practised. The wheat on rape land ripened two days earlier.

BRANDON.

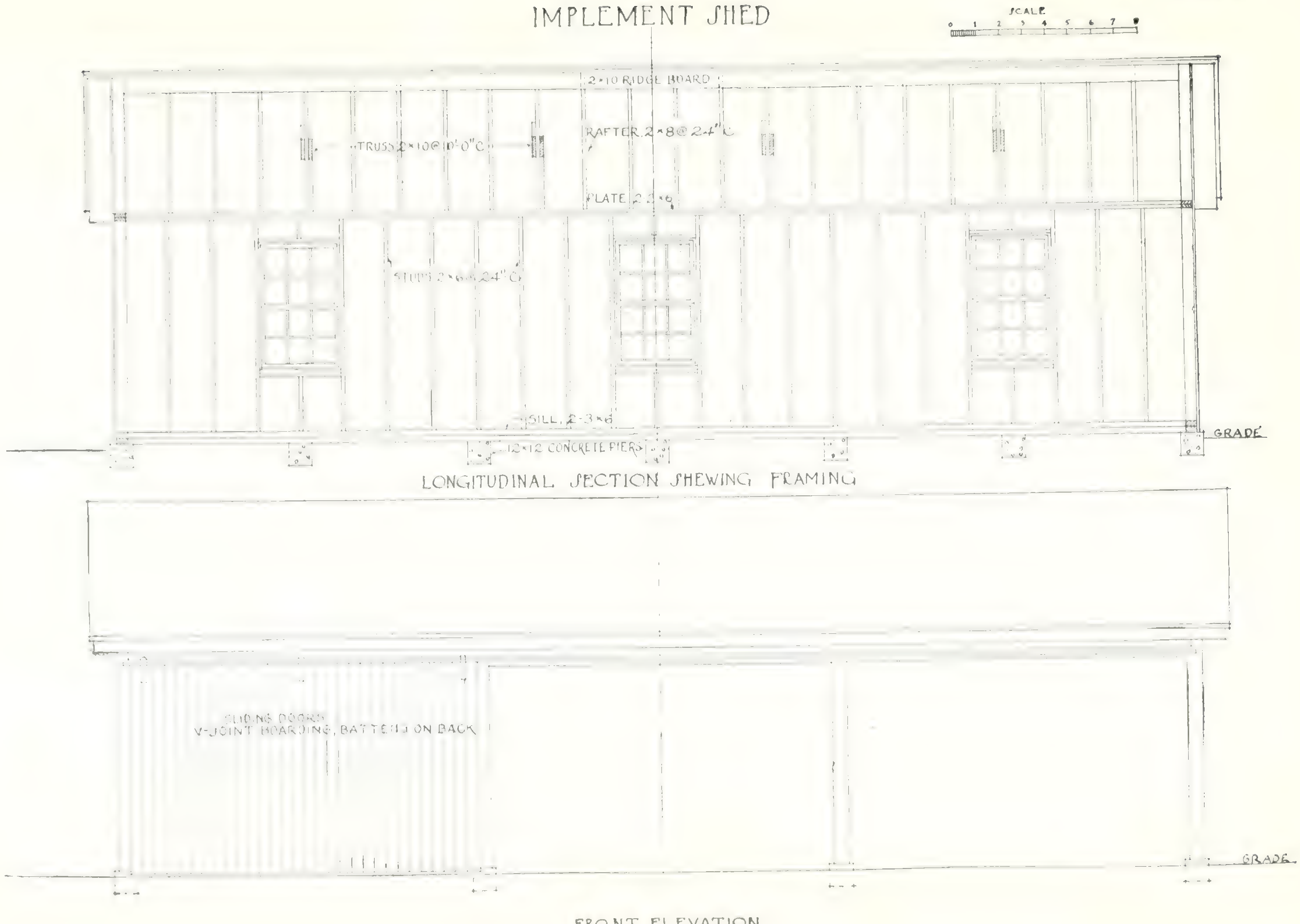
Wheat following alfalfa, Brandon Experimental Farm. This field yielded 44 bushels per acre in a season when the general crop was about two-thirds average.

IMPLEMENT SHED

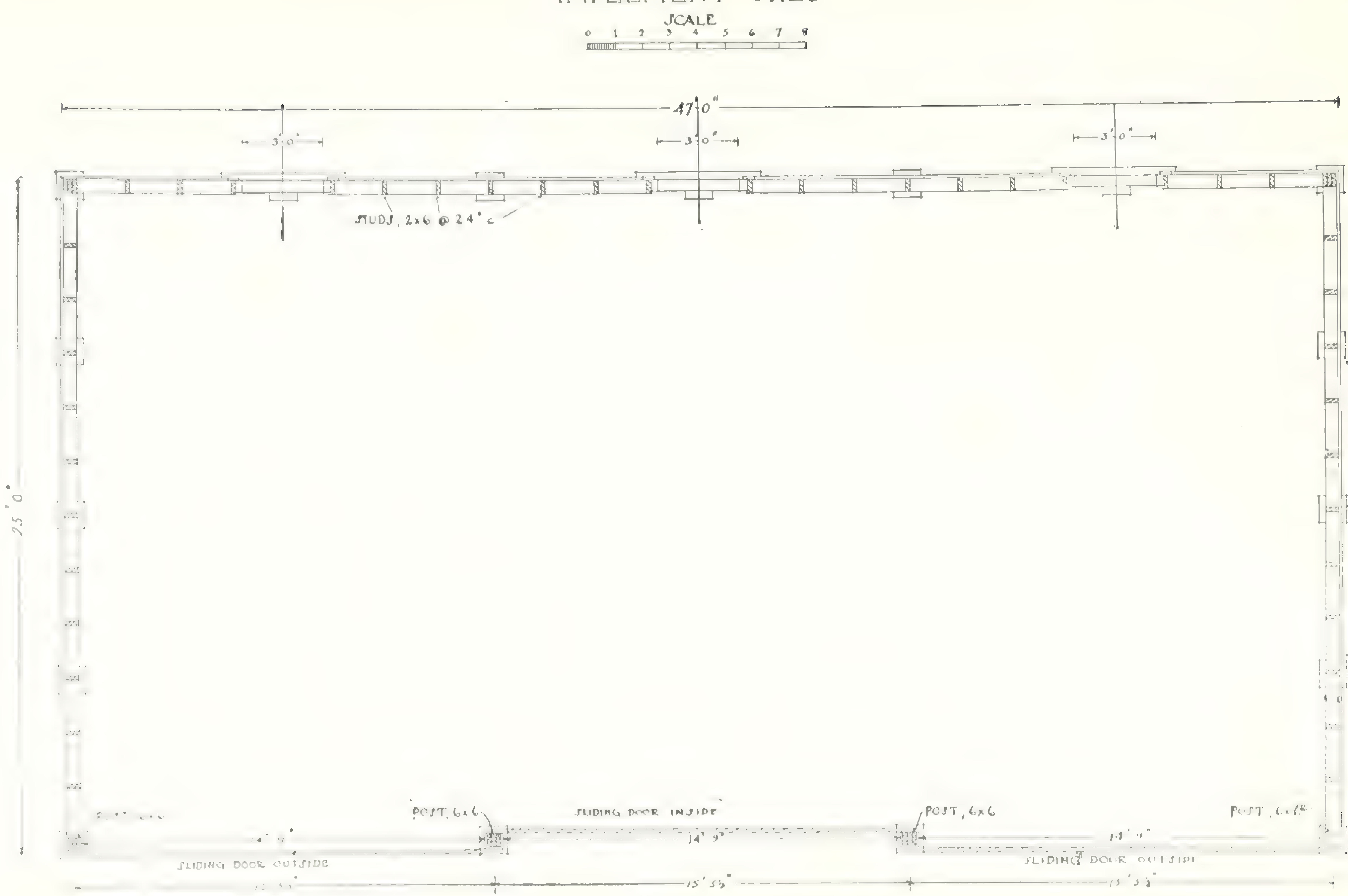


CROSS SECTION

Plate VIII


IMPLEMENT SHED
SCALE
0 1 2 3 4 5 6 7 8
2×10 RIDGE BOARD
TRUSS 2×10 @ 10'-0" C
RAFTER 2×8 @ 2'-4" C
PLATE 2-2×6
STUDS 2×6 @ 24" C
SILL 2-3×6
12×12 CONCRETE PIERS
GRADE
LONGITUDINAL SECTION SHEWING FRAMING
SLIDING DOORS
V-JOINT BOARDING, BATTENS ON BACK
GRADE
FRONT ELEVATION

IMPLEMENT SHED



PLAN No. 1

FALL Cultivation before Summer-fallowing.

Plot No.	Treatment given.	Yield of Wheat 1914.	
		Bush.	Lb.
12	Plough 6 inches June 15, harrow and pack if necessary, cultivate as necessary	42	40
14	Fall cultivate before summer-fallowing. Plough 6 inches June, harrow and pack if necessary, cultivate as necessary	45	00
15	Fall plough 4 inches before summer-fallowing. Plough 6 inches June, harrow and pack if necessary, cultivate as necessary.	44	00

The cultivation given plot No. 14 was a double discing. The increase in crop if dependable would pay for this work.

PACKING *versus* NO PACKING.

As a check on the results obtained in the regular packing experiment, two plots are used in this summer-fallowing experiment.

Plot No.	Treatment given.	Yield of Wheat.			
		1914.		Average of 5 years.	
		Bush.	Lb.	Bush.	Lb.
16	Plough 6 inches June, pack, cultivate as necessary	43	00	47	00
17	Plough 6 inches, June, no packing, otherwise same as other plot	40	40	43	7

This would indicate that it pays to pack summer-fallow land as soon as it is ploughed.

STUBBLE TREATMENT.

The purpose of this experiment is to determine the best method of handling land that has produced one grain crop and is intended to be sown to grain again. To provide the working material, each year, thirteen plots of wheat are sown on summer-fallowed land prepared in a uniform manner. The stubble land left after this wheat is removed is used in the fall and spring for the operation of the experiment.

WHEAT Stubble Land to be Sown to Wheat.

Plot No.	Treatment given.	Yield of Wheat.			
		1914.		Average of 3 years.	
		Bush.	Lb.	Bush.	Lb.
1	Plough, autumn	37	10	31	13
2	Disc harrow, autumn	39	10	33	53
3	Burn stubble, then disc, autumn	40	20	34	7
4	Burn stubble, then plough, autumn	43	00	33	53
5	Burn stubble in spring, seed at once	44	30	34	57
6	Plough in spring, seed at once	41	00	35	37
7	Disc at cutting time, spring plough	39	50	33	7
8	Disc at cutting time, autumn plough	40	20	34	43
9	Plough autumn, subsurface pack at once	42	00	36	3
10	Plough spring, seed, subsurface pack	40	20	32	7

It is not advisable to attempt to draw conclusions from these results until the average of a larger number of years is obtained.

WHEAT Stubble Land to be Sown to Oats.

Plot No.	Treatment given.	Yield of Oats.			
		1914.		Average of 3 years.	
		Bush.	Lb.	Bush.	Lb.
11	Plough autumn, subsurface pack at once	87	2	85	10
12	Plough spring, seed, subsurface pack	90	00	84	31
13	Cultivate autumn, spring plough, seed	90	20	92	2

BRANDON.

SEEDING TO GRASS AND CLOVER.

This experiment is conducted for the purpose of finding the best preparatory crops for seeding down with or without a nurse crop. The seeding mixture used in this experiment is 10 pounds of western rye grass and 10 pounds of red clover.

Plot No.	Treatment given.	Yield of Hay per acre. 1914.	Yield of Hay per acre. Average of 2 years.
		Tons. Lb.	Tons. Lb.
1	Seeding with nurse crop after summer-fallow	2 640	3 680
2	Seeding alone after summer-fallow	2 1,480	4 400
3	Seeding with nurse crop after hoed crop	2 1,320	3 1,590
4	Seeding alone after hoed crop	2 920	4 60
5	Seeding with nurse crop after first year wheat	2 -	2 1,500
6	Seeding alone after first year wheat	2 1,040	3 340
7	Seeding with oats to cut green after first year wheat	2 40	2 1,440
8	Seeding alone after first year wheat, manure 8 tons per acre ploughed in preceding fall	2 1,000	3 80
9	Seeding with nurse crop after second year wheat	2	2 1,380
10	Seeding alone after second year grain (oats)	2 560	2 1,140
11	Seeding with nurse crop after second year wheat following hoed crop	1 1,240	2 1,020
	Average of plots 1, 3, 5 and 9, seeding with nurse crop		3 265
	Average of plots 2, 4, 6 and 10, seeding alone		3 985

It is quite apparent that seeding on summer-fallow or hoed-crop land gives decidedly better results than after grain crops. The terms "first-year wheat" and "second-year wheat" are intended to mean one and two crops of wheat after the land has been summer-fallowed. It will be observed that the more crops of grain that have been grown, the poorer is the result with the grass.

While slightly better results have been obtained by seeding alone than with nurse crops the difference is not sufficiently great to justify the loss of the crop of grain. This conclusion will apply only to districts where the supply of moisture is as great as at Brandon; in drier localities the opposite might be true. The catch of young plants was usually better with a nurse crop than without, but in the following summer, when dry weather came, the plots that had been sown alone grew the more vigorously.

BREAKING SOD FROM CULTIVATED GRASSES AND CLOVERS.

The following methods are being tried in this experiment:—

1. Plough, July 20 to 30, 5 inches deep. Pack and disc at once, disc in fall.
2. Plough, October, 5 inches deep, pack, disc harrow.
3. Plough, early July, 3 inches deep, backset September, cultivate as necessary.
4. Stiff-tooth rip, July, plough 5 inches deep September, cultivate.
5. Spring plough 5 inches deep, seed same spring to wheat.
6. Duplicate No. 5, sow flax.
7. Repeat No. 5, sow peas.
8. Plough May 15, work as summer-fallow.

A uniform sod has been grown on which to try this experiment. A mixture of timothy, western rye grass, red clover and alfalfa was used for this purpose. One set of plots has been broken according to the various treatments but results are not available yet.

APPLICATION OF BARNYARD MANURE.

Methods of applying barnyard manure on four different crops are tried in this experiment.

APPLICATION of Barnyard Manure for Corn on Land which has grown two Crops of Wheat.

Plot No.	Treatment Given.	Yield of Corn per Acre.			
		1914		Average of 2 years	
		Tons.	Lb.	Tons	Lb.
1	No manure, land fall ploughed	9	1,320	10	260
2	Apply on surface in fall after ploughing, work at once.	11	80	12	340
3	Apply in spring on surface of fall-ploughed land, work in at once	7	1,880	11	390
4	Plough in, in fall, right after applying	11	1,370	13	1,060
5	Plough in, in spring, right after applying	11	1,200	11	1,000
6	Winter apply, plough in spring	13	960	12	1,880
7	Winter apply, green manure, plough in spring	11	1,320	12	1,660

With the exception of plot 7, all received rotted manure. The quantity used was 12 tons per acre in every case. Method No. 4 gives the best average for the two years, and is probably as safe a method as any.

APPLICATION of Barnyard Manure for Corn on Summer-Fallow.

Plot No.	Treatment given	Yield of Corn per Acre.			
		1914.		Average of 2 years	
		Tons	Lb.	Tons	Lb.
8	Winter, apply green manure, disc in	13	640	14	1,520
9	No manure	13	520	14	660

BRANDON.

Application of Barnyard Manure for Wheat (Second Crop after Summer-Fallow).

Plot No.	Treatment Given.	Yield of Wheat per Acre, 1914	
		Bush.	Lb.
1	Apply in winter green manure, disc in	39	20
3	Top dress with spreader after seeding	35	50
5	No manure	32	30
6	Apply in fall and plough in	40	10
7	Apply in spring and plough in	40	30
8	No manure, stubble disced in before ploughing	35	40
9	No manure, stubble burned	36	40

Twelve tons per acre were applied in each case, unless otherwise stated. The stubble land was fall ploughed in the case of each plot except No. 7. Rotted manure was used except on plot 1.

Application of Barnyard Manure for Wheat on Summer-Fallow.

Plot No.	Treatment Given.	Yield of Wheat per Acre, 1914.	
		Bush.	Lb.
2	Apply in winter green manure on summer-fallow, disc in	45	10
4	Top dress with spreader, grain sown on summer-fallow	42	
5	No manure	40	

APPLICATION OF BARNYARD MANURE FOR BARLEY (SECOND CROP AFTER SUMMER-FALLOW).

Twelve tons per acre of rotted manure were applied except where otherwise stated. Wheat was the preceding crop on all plots and the land was all fall-ploughed except in plot 7.

Application of Barnyard Manure for Barley (Second Crop after Summer-Fallow).

Plot No.	Treatment Given.	Yield of Barley per Acre.	
		Bush.	Lb.
1	Apply winter, green manure, disc in	53	46
3	Top dress with spreader after seeding	53	16
5	No manure	55	
6	Apply in fall and plough in	65	10
7	Apply in spring and plough in	59	18
8	No manure, stubble disced in before ploughing	55	20
9	No manure, stubble burned	58	6

Brandon.

APPLICATION of Barnyard Manure for Barley on Summer-Fallow.

Plot No.	Treatment Given.	Yield of Barley per Acre.	
		Bush.	Lb.
2	Apply in winter, green manure on summer-fallow, disc in	56	32
4	Top dress with spreader, grain sown on summer-fallow	62	24

APPLICATION of Barnyard Manure for Oats (Second Crop after Summer-Fallow).

Twelve tons of rotted manure were applied except where otherwise stated. Wheat was the preceding crop on all plots, and the land was all fall ploughed except in plot 7.

Plot No.	Treatment Given.	Yield of Oats Per Acre.	
		Bush.	Lb.
1	Apply in winter, green manure, disc in	83	8
3	Top dress with spreader after seeding	64	14
5	No manure	73	8
6	Apply in fall and plough in	82	12
7	Apply in spring and plough in	83	18
8	No manure, stubble disced in before ploughing	77	12
9	No manure, stubble burned	75	..

APPLICATION of Barnyard Manure for Oats on Summer-Fallow.

Plot No.	Treatment Given.	Yield of Oats per Acre.	
		Bush.	Lb.
2	Apply in winter green manure on summer-fallow, disc in	76	6
4	Top dress with spreader, grain sown on summer-fallow	78	18

It is apparent that the results on application of barnyard manure are too variable in this one season's work to draw any conclusions as yet.

GREEN MANURING.

In this experiment the growing of a crop of peas or vetches to be ploughed under is compared with a bare summer-fallow as a preparation for grain crops. Also, one plot of summer-fallow receives an application of barnyard manure. Following the season in which the experimental treatment is given, wheat is grown the next year, and oats the second one.

BRANDON.

GREEN Manuring for Wheat followed by Oats.

Plot No.	Treatment Given.	Yield of Wheat following treatment.				Yield of Oats second season after treatment.			
		1914		Average of 3 years.		1914		Average of 2 years.	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1	Summer-fallow	49	30	46	37	95	30	101	26
2	Peas, two bushels Golden Vine (or other similar variety) ploughed under early in July	50	..	46	33	87	22	94	6
3	Peas, two bushels Golden Vine, ploughed under when in blossom	31	40	40	3	92	32	9[illegible]	32
4	Tares, 1 bushel per acre, ploughed under late July	35	50	42	57	77	22	94	29
5	Summer-fallow, barnyard manure, 12 tons per acre, applied on summer-fallow in September	40	..	50	47	88	28	100	5
6	Summer-fallow	42	20	47	20	88	18	98	28

Wheat plots No. 3 and 4 showed a considerable quantity of weeds and volunteer grain, due doubtless to the later date at which these plots are ploughed.

The results of these experiments seem to indicate that green crops ploughed under give as good results as summer-fallow, if they are ploughed under early and the land kept clean afterward, but the yield is decreased when the green crop is allowed to grow until near the end of July. This is probably due to too great drying out of the land. Barnyard manure would seem to be preferable to green manuring as a means of fertilizing the land.

SEED-BED PREPARATION.

In this experiment three degrees of preparing a seed-bed are compared. This is tried with wheat on summer-fallow and with oats on fall ploughed stubble land.

PREPARATION OF SEED-BED FOR OATS ON FALL PLOUGHING.

The fall ploughing is done uniformly well on all plots, and the experimental treatment refers only to the work in the spring. What constitutes "poor," "good," and "extraordinary" treatment will vary according to the soil and season. In 1914 the soil was mellow and in fine condition naturally, so that very little work was required to prepare a first-class seed-bed. The "poor" plot got no spring cultivation, the "good" got one stroke of the harrow, and the "extraordinary" got three strokes of the harrow and a packing.

PREPARATION of Seed-bed for Oats.

Plot No.	Treatment Given.	Yield of Oats per Acre.			
		1914.		Average of 3 years	
		Bush.	Lb.	Bush.	Lb.
1	Poor preparation	91	4	89	11
2	Good preparation	92	32	95	23
3	Extraordinary	104	14	101	26

From this it will be seen that it pays to work up a good seed-bed in the spring before sowing on fall or spring ploughing.

BRANDON.

PREPARATION OF SEED-BED FOR WHEAT ON SUMMER-FALLOW.

In this part of the experiment, the summer-fallow was all done equally well, the difference in cultivation being all in the spring. "Poor" got no spring cultivation; "good" got one harrowing; "extraordinary" got three harrowings and packing both before and after seeding.

PREPARATION of Seed-bed for Wheat.

Plot No.	Treatment Given.	Yield of Wheat per Acre.			
		1914.		Average of 3 years	
		Bush.	Lb.	Bush.	Lb.
1	Poor preparation	48	50	42	7
2	Good preparation	47	20	42	43
3	Extraordinary preparation	49	20	42	40

The results would indicate that a well worked summer-fallow does not need spring cultivation.

SOIL PACKERS.

In order to obtain information in regard to the use of soil packers, this experiment has been conducted since 1911. Three types of packers are being used, and a large number of methods of application are being tried. The work on the land, other than packing, is kept as uniform as possible, and all cultivation necessary to good farming is performed.

SOIL PACKING in preparation for Wheat following Summer-fallow.

Plot No.	Treatment given.	YIELD OF WHEAT PER ACRE.			
		1914.		Average of 3 years	
		Bush.	Lb.	Bush.	Lb.
1	No packing	41	30	43	37
2	Packed with surface packer after seeding	44	..	48	3
3	Packed with surface packer after seeding, harrowed after packing	43	..	43	47
4	Packed with subsurface packer after seeding	44	10	47	..
5	Packed with subsurface packer after seeding, harrowed after packing	39	20	43	3
6	Packed with combination packer after seeding	46	50	47	7
7	Packed with combination packer after seeding, harrowed after packing	44	50	47	7
8	Packed with surface packer both before and after seeding	44	20	45	7
9	Paked with subsurface packer both before and after seeding	44	30	45	57
10	Packed with combination packer both before and after seeding	44		44	47
11	Packed with surface packer before seeding	43	20	46	27
12	Packed with subsurface packer before seeding	45	40	44	27
13	Packed with combination packer before seeding	45	30	47	17
14	No packing	42	40	45	20
15	Packed with surface packer right after ploughing summer-fallow	41	30	44	30
16	Packed with subsurface packer right after ploughing summer-fallow	43	50	44	50
17	Packed with combination packer right after ploughing summer-fallow	43	10	44	50
18	Packed with surface packer right after ploughing summer-fallow, and again in spring after seeding	44	10	47	30
19	Packed with subsurface packer right after ploughing summer-fallow, and again in spring after seeding	44	20	47	17
20	Packed with combination packer right after ploughing summer-fallow, and again in spring after seeding	38	40	47	33
21	No packing	38	50	45	3
22	No packing, grain harrowed when 6 inches high	36	50	43	10
23	Packed with surface packer when grain is 6 inches high	38	50	43	33
24	Rolled with smooth roller when grain is 6 inches high	40	10	43	10
25	No packing	38	50	42	7

BRANDON.

SUMMARIES of Results of Packing on Summer-Fallow.

Kind of packer.	Average Yield for 3 years.	
	Bush.	Lb.
Surface packer (average of plots 2, 8, 11, 15 and 18)	46	21
Subsurface packer (average of plots 4, 9, 12, 16 and 19)	45	46
Combination packer (average of plots 6, 10, 13, 17 and 20)	46	19
No packer (average of plots 1, 14, 21 and 25)	43	13

Time of packing.	Average Yield for 3 years.	
	Bush.	Lb.
After seeding (average of plots 2, 4 and 6)	47	23
Before seeding (average of plots 11, 12 and 13)	46	4
Before and after seeding (average of plots 8, 9 and 10)	45	17
At time of ploughing summer-fallow (average of plots 15, 16 and 17)	44	43
At time of ploughing summer-fallow and after seeding (average of plots 18, 19 and 20)	47	29

Packer *vs.* Harrow as last implement.	Average Yield for 3 years.	
	Bush.	Lb.
Packer applied last (average of plots 2, 4 and 6)	47	23
Harrowed after packing (average of plots 3, 5 and 7)	44	42

There is nothing very conclusive in the results as yet. Certainly no one type of packer has been proven to be superior to the others. However, all types, on the average, give an increase of about 3 bushels per acre over no packing. This is not large, but it is worth while. With regard to time of packing, the results obtained seem to favour packing after seeding as being the most effective. The effect of harrowing after packing has been to decrease the yield.

BRANDON.

SOIL PACKING FOR WHEAT ON SPRING PLOUGHED STUBBLE LAND.

The land used for this part of the experiment and for the fall-ploughing section which follows had grown one crop of wheat after summer-fallowing.

SOIL Packing for Wheat on Spring Ploughed Stubble Land.

Plot No.	Treatment given.	Yield of Wheat per acre. 1914.		Yield of Wheat per acre. Average of 3 years.	
		Bush.	Lb.	Bush.	Lb.
1	Packed with subsurface packer before seeding	44	10	39	30
2	Packed with surface packer before seeding	40	50	39	43
3	Packed with combination packer before seeding	41	..	38	33
4	Packed with subsurface packer before and after seeding	41	..	39	53
5	Packed with surface packer before and after seeding	32	50	37	27
6	Packed with combination packer before and after seeding	38	40	37	40
7	No packing	40	30	37	17
8	Packed with surface packer after seeding	41	30	38	10
9	Packed with subsurface packer after seeding	41	20	41	..
10	Packed with combination packer after seeding	42	40	38	30
11	No packing	46	..	38	13

SUMMARIES of Results of Packing on Spring Ploughed Stubble Land.

Kind of packer.	Average Yield for 3 years.	
	Bush.	Lb.
Surface packer (average of plots 2, 5 and 8)	38	27
Subsurface packer (average of plots 1, 4 and 9)	40	8
Combination packer (average of plots 3, 6 and 10)	38	14
No packer (average of plots 7 and 11)	37	45

Time of packing.	Average Yield for 3 years.	
	Bush.	Lb.
Before seeding (average of plots 1, 2 and 3)	39	15
After seeding (average of plots 8, 9 and 10)	39	13
Before and after seeding (average of plots 4, 5 and 6)	38	20

These averages show too little difference to permit of drawing any conclusions.

BRANDON.

Soil Packing for Wheat on Fall Ploughed Stubble Land.

Plot No.	Treatment given.	Yield of Wheat per acre. 1914.		Yield of Wheat per acre. Average of 3 years.	
		Bush.	Lb.	Bush.	Lb.
12	No packing	42	50	57	50
13	Packed with subsurface packer in fall	45	10	39	27
14	Packed with subsurface packer in spring before seeding	45	50	39	20
15	Packed with subsurface packer in spring after seeding	42	..	39	33
16	Packed with surface packer in fall	42		38	30
17	Packed with surface packer in spring before seeding	42	30	39	27
18	Packed with surface packer in spring after seeding	44	40	39	20
19	Packed with combination packer in fall	42	50	39	47
20	Packed with combination packer in spring before seeding	40	30	39	30
21	Packed with combination packer in spring after seeding	45	50	40	13
22	No packing	42	50	38	27
23	Packed with surface packer in fall and in spring after seeding	45	50	39	33
24	Packed with subsurface packer in fall, and in spring after seeding	42	20	39	53
25	Packed with combination packer in fall and in spring after seeding	44		38	33

Summaries of Results of Packing on Fall Ploughing.

Kind of packer.	Average Yield for 3 years.	
	Bush.	Lb.
Surface packer (average of plots 16, 17, 18 and 23)	39	17
Subsurface packer (average of plots 13, 14, 15 and 24)	39	33
Combination packer (average of plots 19, 20, 21 and 23)	39	31
No packer (average of plots 12 and 22)	38	8

Time of packing.	Average Yield for 3 years.	
	Bush.	Lb.
In fall (average of plots 13, 16 and 19)	39	10
In spring before seeding (average of plots 14, 17 and 20)	39	26
In spring after seeding (average of plots 15, 18 and 21)	39	42
In fall and in spring after seeding (average of plots 23, 24 and 25)	39	20

These very uniform averages do not prove the superiority of any implement or method.

BRANDON.

DEPTH OF SEEDING.

This experiment was tried with wheat on summer-fallowed land, and with oats on fall-ploughed wheat land. A double disc drill was used.

Depths of Seeding Wheat on Summer-Fallow.

Plot No.	Depth of seeding.	Yield of Wheat per acre. 1914. Bush.	Lb.	Average of 3 years. Bush.	Lb.
1	1 inch	45	50	41	33
2	2 inches	42	50	44	43
3	3 inches	42	30	42	37
4	4 inches	43	10	42	37

Depths of Seeding Oats on Wheat Land (Fall Ploughed).

Plot No.	Depth of seeding.	Yield of Oats per acre. 1914. Bush.	Lb.	Average of 3 years. Bush.	Lb.
1	1 inch	92	22	94	11
2	2 inches	86	16	91	33
3	3 inches	82	12	97	9
4	4 inches	87	22	88	11

COMMERCIAL FERTILIZERS.

This experiment was tried with corn on land that had been in grass for one year after having grown wheat and oats.

Plot No.	Fertilizer used.	Yield of Corn per Acre. 1914. Tons.	Lb.
2	Nitrate of soda, 160 pounds per acre	16	840
3	Superphosphate, 300 pounds per acre	13	1,840
4	Muriate of potash, 100 pounds per acre	13	1,840
5	No fertilizer	13	520
6	Nitrate of soda, 160 pounds per acre; superphosphate, 300 pounds per acre; and muriate of potash, 100 pounds per acre	13	1,440
7	Nitrate of soda, 160 pounds per acre; superphosphate, 300 pounds per acre	12	1,520
8	Nitrate of soda, 160 pounds per acre; muriate of potash, 100 pounds per acre	13	520
9	Superphosphate, 300 pounds per acre; muriate of potash, 100 pounds per acre	12	920
10	No fertilizer	11	1,480
11	Basic slag, 500 pounds per acre	11	1,480
12	No fertilizer	12	120
13	No fertilizer	13	200
14	Barnyard manure, 16 tons per acre	14	720
15	Barnyard manure, 8 tons per acre	14	640

Brandon.

UNDERDRAINAGE.

To see if ordinary Manitoba soil would be benefited by underdrainage, two plots were drained with tile, one at a depth of 3 feet and the other 4 feet.

Treatment.	Yield of Wheat per Acre.	
	Bush.	Lb.
Average of two drained plots	46	..
Average of eight undrained plots	44	9

ALFALFA SEEDED WITH OR WITHOUT NURSE CROP.

It is the general custom through the West to recommend strongly that alfalfa be sown alone. Nurse crops are generally believed to be very injurious. However, no very definite data appeared to be available on this question. In order to test the matter out, an acre of alfalfa was sown with a bushel of barley used as nurse crop. This was sown on corn stubble and was part of a field of about 5 acres, on the remainder of which the alfalfa was sown alone. The alfalfa sown with the barley germinated all right, but the growth it made was very weak and spindly. It is impossible as yet to say how it has withstood the winter, but the indications in the fall were not at all hopeful. The alfalfa sown alone made a strong, vigorous growth and went into winter in first-class condition.

QUANTITY OF SEED PER ACRE.

Flax.—Duplicate plots of flax were sown at different rates of seed per acre. All were sown on the same day (May 16) on the same piece of land. The results were as follows:—

Quantity of seed used per Acre.	Date of Maturity.	Yield of Flax per Acre.			
		1914.		Average of 2 years	
		Bush.	Lb.	Bush.	Lb.
Lb.					
18	Aug. 12	10	45	14	18
23	" 12	10		13	12
28	" 11	10	40	15	..
33	" 11	9	36	14	6
38	" 11	10	40	12	28

The results are not very conclusive but seem to favour the common practice of sowing ½ bushel (28 pounds) per acre.

Alfalfa.—A similar test was tried with alfalfa. The following rates were used: 7½ pounds, 10 pounds, 12½ pounds, 15 pounds, 17½ pounds and 20 pounds per acre. Good germination and a good season's growth were obtained on all plots. It is, of course, impossible to report yields until the second season.

BRANDON.

DATES OF SEEDING.

Flax.—In order to obtain definite figures on the question of the proper date to sow flax, plots were sown every half month from May 1 to June 15. One-half bushel of seed was used in each case on summer-fallowed land. The late-sown flax received a little more cultivation than the early-sown in order to keep down the weeds.

Date of sowing Flax.	Date of Ripening.	Yield per Acre.	
		Bush.	Lb.
May 1	Aug. 5	12	23
May 15	Aug. 8	12	13
June 1	Aug. 20	9	6
June 15	Sept. 13	4	36

It will be observed that May 1 and May 15 gave practically the same results, but that there was a rapid decrease after May. The crop from June 15 sowing was practically a complete failure, being considerably frosted, as well as a light crop.

Alfalfa.—Different dates of seeding were tried with alfalfa with equally as striking results. Plots of alfalfa were sown every half-month from May 1 to July 15. The land used was well-prepared summer-fallow. Good catches were obtained from the May 1 and May 15 seeding, a fairly good catch was obtained from June 1 seeding, June 15 gave poor results, July 1 very poor, and that sown on July 15 was a complete failure. It is not likely that such striking results would be obtained every year, as the extreme heat and drought of midsummer this year were exceptionally hard on new alfalfa seeding. Nevertheless, it is likely that early seeding will nearly always give the best results.

EXPERIMENTAL FARM FOR SOUTHERN SASKATCHEWAN, INDIAN HEAD, SASK.

REPORT OF THE ASSISTANT TO THE SUPERINTENDENT, K. MacBEAN, B.S.A.

WEATHER CONDITIONS AND CROP NOTES, 1914.

The season of 1914 was very unfavourable for the production of good field crops in southern Saskatchewan. While the spring opened up comparatively early and there were a few early rains, causing a good germination of the early sown wheat, the dry weather during the latter part of May and all of June retarded the growth of this grain and caused an uneven germination of late-sown wheat, oats and barley, the result being that all cereals produced a very short straw and a light yield. The frost on August 9 damaged the wheat crop to quite an extent, also nearly destroyed the fodder corn. The hay and pasture crops were all light. While the crop yields were all comparatively light, the results obtained from different cultural experiments were very outstanding, and many valuable lessons were learned in the conservation of moisture.

In the following table there are recorded the temperature, precipitation and sunshine for 1914:—

Some Weather Observations taken at Experimental Farm, Indian Head, 1914.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	
	°	°	°	Inches.	Inches.	Inches.	Hours.
January	7·19	44	—34	....	12·50	1·25	83·2
February	—4·83	45	—38	....	4·00	0·40	113·2
March	21·93	47	—19	....	10·00	1·00	111·6
April	37·53	70	2	0·09	12·00	1·29	158·5
May	50·54	83	22	0·58	10·00	1·58	243·4
June	59·06	90	40	2·28	....	2·28	219·6
July	69·80	100	42	1·50	....	1·50	304·6
August	59·42	89	29	1·33	....	1·33	231·6
September	54·73	88	28	0·47	....	0·47	181·9
October	44·29	80	10	1·16	....	1·16	126·2
November	24·33	56	—23	0·13	9·00	1·03	65·7
December	1·93	27	—32	....	4·50	0·45	23·3
Total for year	....	....	....	7·54	62·00	13·74	1862·8

FIELD CROP YIELDS.

YIELDS OF SPRING WHEAT.

In the field tests, four named varieties of wheat were used. These were sown on summer-fallow, corn and stubble land. The Marquis is the product of a plot sown with special registered Marquis supplied by the Dominion Cerealist in 1912. The registered Red Fife is from special registered seed supplied from Ottawa in 1914.

Yields of Spring Wheat.

Plot No.	Name of Variety.	Number of days maturing	Yield of grain per acre.	
			Bush.	Lb.
1	Marquis (fallow)	111	45	30
2	Red Fife (fallow)	123	40	52
3	Marquis (stubble)	105	38	29
4	Marquis (fallow)	116	36	54
5	Marquis (fallow)	110	34	30
6	Pioneer (fallow)	110	28	38
7	Marquis (fallow)	112	27	27
8	Marquis (corn stubble)	103	26	23
9	Marquis (stubble)	105	25	54
10	Marquis (fallow)	117	23	50
11	Marquis (stubble)	106	16	29
12	Prelude (fallow)	96	16	26

YIELDS OF WINTER RYE.

In the fall of 1913, a 10 acre field which had produced Prelude wheat was disced and sown with winter rye. This germinated well and gave a fair growth in the fall of 1913, but the dry weather during the summer of 1914 caused a very light yield of grain. The few wild oat plants which were in this field were cut before the seed had become mature enough to grow. A small field of summer-fallow was also sown at the same time. The yield on this was equal to former seasons.

YIELDS OF OATS.

Three varieties of oats were grown in field lots. The field of Victory was damaged to some extent with cutworms until their ravages were stopped by the use of poisoned bran. This was made by mixing one pound of Paris green with 40 pounds of bran, and moistening with sweetened water. The mixture was scattered where the worms were working in the evening. They ate the bran in preference to the grain, and were poisoned. About two applications were sufficient to completely exterminate them.

Yields of Oats.

Plot No.	Name of Variety.	Number of days maturing	Yield of grain per acre.	
			Bush.	Lb.
1	Victory (fallow)	94	80	20
2	Ligowo (fallow)	87	75	18
3	Banner (fallow)	91	72	16
4	Banner (stubble)	87	64	27
5	Banner (stubble)	100	58	8
6	Banner (stubble)	91	44	1

YIELDS OF BARLEY.

Two varieties of six-row barley and one of two-row barley were sown in the fields in 1913. The Manchurian seemed to shell more readily with the wind than did the O. A. C. No. 21.

Plot No.	Name of Variety.	Number of days maturing	Yield of grain per acre.	
			Bush.	Lb.
1	O. A. C. No. 21 (fallow)	84	56	17
2	Manchurian (fallow)	84	55	
3	Canadian Thorpe (fallow)	90	53	40
4	Manchurian (corn stubble)	83	51	38
5	Manchurian (fallow)	87	49	..

YIELDS OF FLAX.

Two of Dr. Saunders' new selections of flax, Novelty and Longstem, were tried out in the field along with Premost. Due to the dry weather immediately after seeding, the yields of all are comparatively low.

Yields of Flax.

Plot No.	Name of Variety.	Number of days maturing	Yield of seed per acre.	
			Bush.	Lb.
1	Premost (fallow)	96	14	..
2	Novelty (fallow)	100	13	49
3	Longstem (fallow)	100	10	..

YIELD OF FIELD PEAS.

A field of 5 acres was sown to Arthur peas. These matured comparatively early and gave a fair yield of peas of good quality.

Yield of Peas.

Plot No.	Name of Variety.	Number of days maturing	Yield of grain per acre.	
			Bush.	Lb.
1	Arthur (fallow)	107	21	55

COST OF PRODUCTION OF FIELD CROPS.

The cost of producing field crops is always one of interest to both the business man and farmer. While conditions on an Experimental Farm are not identical with conditions on an average farm, the results will at least be comparative, and will be valuable if considered in this manner.

Cost of Production of Field Crops, Indian Head, 1914.

Crop.	Area.	Soil Preparation.	Cost per acre.	Cost per bush.	Cost per ton.	Value per acre.	Profit per acre.
	acres.		$ c.	cents.	$ c.	$ c.	$ c.
Wheat	27·75	Summer-fallow	10 63	35		26 00	15 37
Wheat	11·25	Stubble spring ploughed	12 96	47		24 53	11 57
Wheat	6·25	Stubble (burnt)	8 27	50		13 85	5 58
Wheat	5·50	Corn land	10 75	40		22 48	11 75
Oats	11·00	Stubble spring-ploughed	11 70	23		20 07	8 37
Barley	6·00	Corn land	12 01	23		27 14	15 13
Hay	16·50	First crop after seeding with nurse crop	6 99		13 45	8 03	1 19
* Corn	11·50	Summer-fallow, top-dressed	13 80		1 84	21 96	8 15

* Cost of summer-fallowing, not included.

ROTATION OF CROPS.

The rotation of crops is a very important experiment since it not only considers the yield of grain, hay, corn and roots obtained in the different arrangements, but also aims to obtain the cost of production and profit per acre.

ROTATION "C" (THREE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

This rotation requires the area to be divided into three approximately equal fields. This rotation is followed by the farmers throughout the southern portion of the province.

Indian Head.

The only objection to it is that it tends to exhaust the vegetable matter and facilitates the introduction of weeds. This year the field that was in stubble was badly infested with Quack grass and, because of its having to be cropped with wheat, considerable difficulty was experienced in keeping the grass from spreading.

ROTATION "J" (SIX YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.
Fourth year.—Oats, seeded down with 8 pounds western rye and 8 pounds alfalfa per acre.
Fifth year.—Hay.
Sixth year.—Hay or pasture.

This rotation would require the farm to be divided into six fields of equal size, and if some pasture is necessary it requires fencing. This is a good mixed farmers' rotation since it includes the maximum amount of grain and at the same time allows for the production of considerable feed and pasture. The only objection is the difficulty of obtaining a catch of grass when seeding with a nurse crop on the second-year wheat stubble.

ROTATION "P" (EIGHT YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.
Fourth year.—Summer-fallow.
Fifth year.—Corn, manured at the rate of 15 tons per acre.
Sixth year.—Barley, seeded with 8 pounds rye grass and 8 pounds alfalfa per acre.
Seventh year.—Hay.
Eighth year.—Pasture.

This rotation requires the farm to be divided into eight fields, and is suited to a farmer who wishes to raise some grain and keep a comparatively large amount of live stock. It would seem to be well adapted to a dirty farm, since out of eight years there are six in succession in which the land receives cultivation or crops which are conducive to the eradication of weeds.

ROTATION "R" (NINE YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Corn manured at the rate of 15 tons per acre.
Third year.—Wheat.
Fourth year.—Oats.
Fifth year.—Summer-fallow.
Sixth year.—Wheat.
Seventh year.—Oats, seeded down with a mixture of 8 pounds western rye grass and 8 pounds alfalfa.
Eighth year.—Hay.
Ninth year.—Pasture.

This rotation would be adapted to a stock farm, as in nine years there are only two crops of wheat.

In order to determine the profits from these rotations, fixed values are used from year to year. These may be found on page 245 of this report.

PROFITS FROM DIFFERENT ROTATIONS.

Since the final test for the different rotations is the profit given per acre, a table showing this is given herewith.

ROTATION "C"

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
			Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st....	Wheat........	Fallow.........	6 25	12 50	3 75	......	......	......	......	48	......	......
2nd...	Fallow........	Wheat.........	6 25	12 50	20 94	9·50	1 80	......	......	25	......	......
3rd....	Wheat........	Wheat.........	6 25	12 50	20 20	7·75	1 47	5	3·5	19	......	......
	Aggregate		18 75	37 50	44 89	17·25	3 27	5	3·5	92	......	......
	Average per acre.............		......	2 00	2 39	0·92	0 17	0·27	0·18	4·9	......	......

ROTATION "J"

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
3rd....	Wheat........	Wheat.........	5	10 00	16 05	67·75	12 87	......	2·00	35·25	......	......
4th....	Wheat........	Oats...........	5	10 00	15 44	15·75	3 00	......	15·25	23·75	......	......
5th....	Oats..........	Hay...........	5	10 00	9 80	8·00	1 52	2·00	5·25	......	......	......
6th....	Hay..........	Pasture........	5	10 00	9 80	7·00	1 33	2·00	8·00	......	......	......
1st....	Pasture.......	Fallow.........	5	10 00	3 00	......	......	......	......	49·50	......	......
2nd...	Fallow........	Wheat.........	5	10 00	19 05	14·25	2 71	......	4·00	20·00	......	......
	Aggregate....................		30	60 00	73 14	112·75	21 43	4·00	34·50	128·50	......	......
	Average per acre		......	2 00	2 44	3·76	0 71	0 13	1·15	4·28	......	......

ROTATION "P"

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
4th....	Wheat........	Fallow.........	6	23 25	......	......	......	......	1	39·25	......	......
5th....	Fallow........	Corn...........	6	23 25	12 61	87·50	16 62	11	48	28·25	......	......
6th....	Corn..........	Barley.........	6	23 25	17 50	19	3 61	......	10	22·50	......	......
7th....	Barley........	Hay...........	6	23 25	11 76	22	4 18	4·25	21·75	......	......	......
8th....	Hay..........	Pasture........	6	23 25	11 76	11	2 09	3	11·75	......	......	......
1st....	Pasture.......	Fallow.........	6	23 25	3 60	......	......	......	......	48·25	......	......
2nd...	Fallow........	Wheat.........	6	23 25	18 90	9·75	1 85	......	......	25·25	......	......
3rd....	Wheat........	Wheat.........	6	23 25	20 04	9·75	1 85	......	5	48·25	......	......
	Aggregate....................		48	186 00	96 17	159·00	30 20	18·25	97·50	211·75	......	......
	Average peracre..............		......	3 87	2 00	3·31	0 63	0·38	2·03	4·41	......	......

ROTATION "R"

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
5th....	Oats..........	Fallow.........	5·5	20 16	3 30	......	......	......	......	40	......	......
6th....	Fallow........	Wheat.........	5·5	20 16	12 99	30	5 70	......	11	20	......	......
7th....	Wheat........	Oats...........	5·5	20 16	16 04	12	1 80	......	3	32·75	......	......
8th....	Oats..........	Hay...........	5·5	20 16	10 78	34	6 46	6.5	19	......	......	......
9th....	Hay..........	Pasture........	5·5	20 16	10 78	10	1 90	3·25	8·50	......	......	......
1st....	Pasture.......	Fallow.........	5·5	20 16	3 30	9	1 71	2·50	11	64	......	......
2nd...	Fallow........	Corn...........	5·5	20 16	8 26	140	26 60	10·00	37·75	12	......	......
3rd....	Corn..........	Wheat.........	5·5	20 16	15 42	11·25	2 13	......	4·75	23	......	......
4th....	Wheat........	Oats...........	5·5	20·16	16 90	12	2 28	......	4·50	30·50	......	......
	Aggregate....................		49·5	181 44	97 77	338·25	48 58	22·25	99·50	222·25	......	......
	Average per acre..............		......	3 67	1 97	6·83	0 98	·45	2·01	4·49	......	......

INDIAN HEAD.

(three years' duration.)

In raising Crop.							Particulars of Crop.						
							Weight.						
Value of Horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
19 68		35 93	5 75										−5 75
10 25	10 43	55 92	8 95	0 37½			8,940	12,420			125 41	20 05	11 10
10 33	7 21	51 71	8 27	0 50			6,180	8,340			86 57	13 85	5 58
40 26	17 64	143 56									211 98		
2 15	0 94		7 65									11 30	3 65

(six years' duration).

15 13	12 18	66 23	13 24	0 38			10,440	20,400			149 40	29 88	16 64
14 92	11 32	54 68	10 87	0 19			9,622	9,278			105 49	21 10	10 23
2 32		23 64	4 73						4,520		22 60	4 52	−0 21
3 26		24 39	4 86						3,170		15 85	3 17	−1 69
20 29		33 29	6 65										−6 65
9 56	12 88	54 20	10 84	0 29½			11,040	14,280			154 34	30 87	20 03
65 48	36 38	256 43									447 68		
2 18	1 21		8 54									14 92	6 38

(eight years' duration).

16 43		39 68	6 61										−6 61
30 87		83 35	13 89							98,406	147 60	24 60	10 71
12 62	15 10	72 08	12 01	0 23			14,496	17,904			162 86	27 14	15 13
8 54		47 73	7 95						11,250		56 25	9 38	1 43
4 80		41 90	6 98						6,140		30 70	5 12	−1 86
19 78		46 63	7 77										−7 77
10 35	14 98	69 33	11 55	0 32			12,840	14,400			178 40	29 73	18 18
21 48	9 52	76 14	12 69	0 56			8,160	12,720			115 16	19 19	6 50
124 87	39 60	476 84									690 97		
2 60	0 83		9 93									14 39	4 46

nine years' duration).

16 40		39 86	7 25										−7 25
11 94	10 78	61 57	11 19	0 40		6	9,240	10,440			128 45	23 36	12 17
14 45	9 88	62 33	11 35	0 25		6	8,408	11,872			95 85	17 43	6 08
8 21		45 61	8 49						11,145		55 72	10 13	1 92
3 77		36 61	6 65						5,920		29 60	5 38	−1 27
30 65		55 82	10 15						3,900		19 50	3 55	−6 60
20 45		75 47	13 72							70,832	106 25	19 32	5 60
11 04	10 36	59 11	10 75	0 40		6	8,880	10,560			123 68	22 48	11 75
14 03	12 96	66 33	12 06	0 20		6	11,016	14,784			124 94	22 72	10 66
130 94	43 98	502 71									683 99		
2 65	0 89		10 16									13 82	3 66

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SUMMARY of Profits of Rotations "C," "J," "P" and "R."

Rotation.	Profit per acre 1914	Profit per acre Average for 3 years.
	$ c.	$ c.
"C" (three years' duration)	3 65	5 67
"J" (six years' duration)	6 38	10 05
"P" (eight years' duration)	4 46	8 59
"R" (nine years' duration)	3 66	7 80

SOIL CULTURAL EXPERIMENTS.

DEPTH OF PLOUGHING SUMMER-FALLOW TO BE SOWN TO WHEAT.

The soil in this experiment was ploughed in June at depths varying from 3 to 8 inches, and from 5 to 8 inches, with 4-inch sub-soiling. Immediately after ploughing the plots were subsurface packed and harrowed, and then cultivated throughout the season to keep down the weeds.

DEPTH of Ploughing Summer-fallow to be Sown to Wheat.

Plot No.	Depth of ploughing summer-fallow, 1913.	Days to mature.	Yield of wheat per acre, 1914.		Average for 3 years.	
			Bush.	Lb.	Bush.	Lb.
1	Ploughing 3 inches deep	117	34	..	34	10
2	Ploughing 4 inches deep	117	36	40	39	10
3	Ploughing 5 inches deep	117	36	..	39	10
4	Ploughing 6 inches deep	117	35	20	40	50
5	Ploughing 7 inches deep	117	34	40	41	20
6	Ploughing 8 inches deep	117	36		41	20
7	Ploughing 5 inches deep and subsoiling 4 inches	117	38	40	44	10
8	Ploughing 6 inches deep and subsoiling 4 inches	117	37	20	41	10
9	Ploughing 7 inches deep and subsoiling 4 inches	117	38	..	42	20
10	Ploughing 8 inches deep and subsoiling 4 inches	117	40	..	38	30

DEPTH OF PLOUGHING WHEAT STUBBLE TO BE SOWN TO OATS.

The wheat stubble of 1913, in the above experiment, was ploughed as in the table following for oats. The deep ploughing seems to have had more effect on the second crop than it had on the first, as will be noted from the following table:—

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DEPTH of Ploughing Wheat Stubble to be Sown to Oats.

Plot No.	Depth of ploughing summer-fallow for wheat, 1912.	Depth of ploughing wheat stubble fall of 1913.	Days to mature.	Yield of oats per acre, 1914.		Average for 3 years.	
				Bush.	Lb.	Bush.	Lb.
1	Ploughed 3 inches..........	Ploughed 3 inches deep......	93	43	18	74	14
2	Ploughed 4 inches..........	Ploughed 4 inches deep......	93	41	06	74	24
3	Ploughed 5 inches..........	Ploughed 5 inches deep......	93	49	14	74	24
4	Ploughed 6 inches..........	Ploughed 5 inches deep......	93	49	14	70	20
5	Ploughed 7 inches..........	Ploughed 5 inches deep......	93	47	02	75	..
6	Ploughed 6 inches..........	Ploughed 5 inches deep......	93	44	24	79	14
7	Ploughed 5 inches subsoiled 4 inches..............	Ploughed 5 inches deep......	93	51	26	79	29
8	Ploughed 6 inches subsoiled 4 inches..............	Ploughed 5 inches deep......	93	55	10	85	29
9	Ploughed 7 inches subsoiled 4 inches..............	Ploughed 5 inches deep......	93	61	06	87	17
10	Ploughed 8 inches subsoiled 4 inches..............	Ploughed 5 inches deep......	93	65	30	96	06

DEPTH OF PLOUGHING SOD.

This experiment is being conducted in a four year rotation of:—

First year.—Wheat.
Second Year.—Oats, seeded down with grass.
Third year.—Hay.
Fourth year.—Hay.

The following table gives the yield of wheat the first year and oats the second year, ploughed at varying depths:—

DEPTH of Ploughing Sod to be Sown to Wheat followed by Oats.

Plot No.	Depth of ploughing sod, 1913.	Days to mature	Yield per acre of wheat on sod.		Average.		Depth of ploughing wheat stubble for oats.	Days to mature	Yield of oats per acre on wheat stubble.		Average.	
			Bush.	Lb.	Bush.	Lb.			Bush.	Lb.	Bush.	Lb.
11	Ploughing 3 inches deep..........	118	28	..	25	..	Ploughing 3 inches deep..........	96	50	20	58	14
12	Ploughing 4 inches deep..........	118	22	..	24	20	Ploughing 4 inches deep..........	96	61	06	74	17
13	Ploughing 5 inches deep..........	118	26	40	26	33	Ploughing 5 inches deep..........	96	58	28	67	20
14	Ploughing 3 inches deep..........	118	23	20	24	33	Ploughing 6 inches deep..........	96	49	14	65	03

SUMMER-FALLOW TREATMENT.

The rotation used in this experiment is—
First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Oats.

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While the results from this experiment may seem at first glance to be more or less confusing, if they are carefully analysed some definite conclusions can be drawn. If the first three plots are considered as a definite experiment, it will be noticed that land ploughed between 6 and 8 inches deep in June gave best results. The number of times ploughed, including plots 4 to 9 and plot 12, would seem to indicate that two ploughings sometimes would give a higher yield than a single ploughing, but it is doubtful if the increased yield would pay for the extra ploughing. The result from plot 10 would seem to indicate that in some seasons where late fall pasture was required, it would be advisable to seed with rape. In plots 11 and 13, the benefits from early ploughing are evident. Fall cultivation and fall ploughing, as indicated in 14 and 15, increase the yield over plots 12 and 16.

Treatment of Summer-Fallow to be Sown to Wheat followed by Oats.

Plot No.	Treatment of summer-fallow, 1913.	Days to mature	Yield of wheat per acre on summer-fallow.		Average for 3 years		Days to mature.	Yield of oats per acre following wheat.		Average for 3 years	
			Bush.	Lb.	Bush.	Lb.		Bush.	Lb.	Bush.	Lb.
1	Plough 4 inches June, pack if necessary and practicable, cultivate as necessary	114	42	40	41	30	92	64	24	90	30
2	Plough 6 inches June, pack if necessary and practicable, cultivate as necessary	114	45	20	45	40	92	67	02	92	02
3	Plough 8 inches June, pack if necessary and practicable, cultivate as necessary	114	44	40	45	40	92	82	12	98	18
4	Plough 4 inches June, cultivate. Plough 4 inches September, harrow	114	46	40	46	20	92	62	12	99	24
5	Plough 6 inches June, cultivate Plough 6 inches September, harrow	114	44	..	42	30	92	70	20	92	12
6	Plough 8 inches June, cultivate Plough 8 inches September, harrow	114	44	..	44	..	92	61	06	89	14
7	Plough 6 inches June, cultivate Plough 4 inches September, harrow	114	43	20	44	20	92	69	14	88	28
8	Plough 4 inches June, cultivate. Plough 6 inches September, harrow	114	44	..	40	50	92	61	06	77	12
9	Plough 4 inches June, early as possible cultivate, plough 6 inches September, leave untouched	114	42	..	40	40	92	70	20	88	28
10	Plough 5 inches June seed to rape or other green forage crop and pasture off	114	46	..	39	30	92	70	20	92	32
11	Plough 6 inches May 15, harrow and pack if necessary, cultivate as necessary	114	45	20	43	30	92	63	18	91	21
12	Plough 6 inches June 15, harrow and pack if necessary cultivate as necessary	114	43	20	43	..	92	61	06	79	14
13	Plough 6 inches July 15, harrow and pack if necessary, cultivate as necessary	114	39	20	42	10	92	63	18	90	..
14	Fall cultivate before summer-fallowing plough 6 inches June, harrow and pack if necessary, cultivate as necessary	114	45	20	44	..	92	61	06	90	10
15	Fall plough 4 inches before summer-fallowing plough 6 inches June, harrow and pack if necessary, cultivate as necessary	114	41	20	42	20	92	61	06	88	23
16	Plough 6 inches June, pack, cultivate as necessary	114	42	40	42	50	92	70	20	87	22
17	Plough 6 inches June no packing, otherwise same as other plots.	114	45	20	42	40	92	70	20	93	28

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STUBBLE TREATMENT.

This experiment consists of ten different methods of treating stubble land for wheat, and three in treating stubble land for oats. It will be noticed that the results this season differ considerably from the average, which would seem to indicate that the method would have to be suited to the season.

TREATMENT of Wheat Stubble to be Sown to Wheat.

Plot No.	Treatment given wheat stubble preceding wheat.	Days to mature.	Yield of wheat per acre, 1914.		Average for 3 years.	
			Bush.	Lb.	Bush.	Lb.
1	Plough autumn	113	20	..	22	35
2	Disc harrow autumn	113	23	20	26	05
3	Burn stubble, then disc autumn	113	20	40	25	10
4	Burn stubble, then plough autumn	113	16	40	25	..
5	Burn stubble in spring, seed at once	113	16	40	25	15
6	Plough in spring, seed at once	113	16	..	27	15
7	Disc at cutting time, spring plough	113	16	..	27	55
8	Disc at cutting time, autumn plough	113	14	..	24	25
9	Plough autumn, subsurface pack at once	113	16	..	30	15
10	Plough spring, seed, subsurface pack	113	18	..	27	35

TREATMENT of Wheat Stubble to be Sown to Oats.

Plot No.	Treatment given wheat stubble preceding oats.	Days to mature.	Yield of oats per acre, 1914.		Average for 3 years.	
			Bush.	Lb.	Bush.	Lb.
11	Plough autumn, subsurface pack at once	95	44	24	68	28
12	Plough spring, seed, subsurface pack	95	44	24	73	08
13	Cultivate autumn, spring plough, seed	95	44	24	77	02

SEEDING TO GRASS AND CLOVER.

The results from this experiment have given some valuable information. The yield of hay on summer-fallow and corn land with and without a nurse crop is not very different, but when the seed was put on stubble land the effect of the nurse crop was to greatly decrease the yield of grass.

Seeding to Grass and Clover.

Plot No.	Method of seeding.	Yield of first year hay.	Average for 3 years.
		Tons. Lb.	Tons. Lb.
1	Seeding rye grass 10 pounds and red clover 10 pounds with nurse crop on summer-fallow	2 920	3 1,587
2	Seeding rye grass 10 pounds and red clover 10 pounds alone after summer-fallow	3 1,960	4 1,947
3	Seeding rye grass 10 pounds and red clover 10 pounds with nurse crop on first year after hoed crop	2 160	3 1,987
4	Seeding rye grass 10 pounds and red clover 10 pounds alone after hoed crop	2 1,200	3 1,067
5	Seeding rye grass 10 pounds and red clover 10 pounds with nurse crop on first year wheat stubble	1 1,080	3 027
6	Seeding rye grass 10 pounds and red clover 10 pounds alone after first year wheat	1 1,920	2 560
7	Seeding rye grass and red clover with oats to cut green on first year wheat stubble	1 560	2 1,653
8	Seeding rye grass 10 pounds and red clover 10 pounds alone on first year wheat stubble, manured 8 tons per acre, ploughed preceding fall	2 280	3 960
9	Seeding rye grass 10 pounds and red clover 10 pounds with nurse crop on second year wheat stubble	1 1,440	3 773
10	Seeding rye grass 10 pounds and red clover 10 pounds alone after second year grain oats	2 440	3 1,587
11	Seeding rye grass 10 pounds and red clover 10 pounds with nurse crop on second year after hoed crop	1 1,440	3 173

APPLICATION OF BARNYARD MANURE.

This experiment consists of applying barnyard manure at different times of the year on land prepared differently, and different methods of incorporating the manure with the soil for four of the most important crops.

APPLICATION OF BARNYARD MANURE FOR CORN.

In this experiment a three-year rotation was used:—

First year.—Corn.

Second year.—Wheat.

Third year.—Wheat.

The table shows the yield of corn and two succeeding crops of wheat and also the value of the crops per acre for the entire rotation. In computing the value of the crops, corn was valued at $3 per ton and wheat at 80 cents per bushel.

Indian Head.

APPLICATION of Barnyard Manure for Corn.

Plot No.	Application of manure.	Days to mature.	Yield of corn per acre, 1914.		Days to mature.	Yield of wheat per acre following corn, 1913.		Days to mature.	Yield of wheat per acre following wheat, 1913.		Value of crops per acre for entire rotation.	Average for three years.
			Tons.	Lb.		Bush.	Lb.		Bush.	Lb.	$ cts.	$ cts.
1	No manure, plough second-year stubble in, in autumn	88	3	..	114	22	40	112	26	40	48 48	76 49
2	Apply in autumn after ploughing second-year stubble work in at once	88	4	1,600	114	26	40	112	36	..	64 54	84 22
3	Apply in spring on autumn ploughed second-year stubble work in at once	88	3	1,600	114	22	..	112	31	20	54 07	78 44
4	Apply in autumn on second-year stubble, plough under in autumn	88	4	..	114	20	..	112	32	..	53 60	72 32
5	Apply in spring on second-year stubble, plough under in spring	88	3	..	114	18	40	112	34	..	51 14	75 21
6	Apply in winter on second-year stubble, plough under in spring	88	3	400	114	22	40	112	33	20	54 40	81 92
7	Apply, in winter, green manure (cut straw) on second-year stubble, plough under in spring	88	3	..	114	18	..	112	29	20	46 87	73 71
8	Apply, in winter, green manure (cut straw) on summer-fallow, disc in	88	2	800	114	20	..	......	....		23 20	58 21
9	Summer-fallow no manure	88	3	800	114	20	40	......	....		26 74	68 87

INDIAN HEAD.

APPLICATION OF BARNYARD MANURE FOR WHEAT.

In this experiment a three-year rotation was also followed:—

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

In the following table the yield of wheat on the fallow and stubble land, and also the average yield per acre for the entire rotation is given.

APPLICATION of Barnyard Manure for Wheat.

Plot No.	Application of manure.	Days to mature.	Yield of wheat per acre on wheat stubble.		Days to mature.	Yield of wheat per acre on summer-fallow.		Value of crops per acre for entire rotation.		Average for three years.	
			Bush.	Lb.		Bush.	Lb.	$	cts.	$	cts.
1	Apply, in winter, green manure (cut straw) on first-year stubble, disc in..........	113	34	40	109	19	20	43	21	44	88
2	Apply, in winter, green manure (cut straw) on summer-fallow, disc in............	113	45	20	109	20	..	57	27	51	90
3	Top-dress, with spreader, grain sown on first-year stubble....................	113	40	40	109	16	40	45	88	54	48
4	Top-dress, with spreader, grain sown on summer-fallow........................	113	38	..	109	14	40	42	14	48	44
5	No manure, plough first-year stubble in autumn............................	113	38	40	109	20	..	46	94	48	79
6	Apply on first-year stubble, plough under in autumn............................	113	46	40	109	20	..	53	34	59	46
7	Apply on first-year stubble, plough under in spring............................	113	46	40	109	23	20	56	00	52	98
8	No manure, disc first-year stubble, in autumn............................	113	41	20	109	16	40	46	40	48	18
9	No manure, burn first-year stubble......	113	42	40	109	22	40	52	28	60	18

APPLICATION OF BARNYARD MANURE FOR BARLEY.

In this experiment the three-year rotation has been adopted:—

First year.—Summer-fallow.

Second year.—Wheat or barley, where indicated.

Third year.—Barley or oats, where indicated.

Where barley follows summer-fallow, oats follow barley. Owing to the different cropping systems, a comparison of all the methods of application is somewhat difficult. Plots 2 and 4, in which barley is sown on summer-fallow and followed by oats, must be considered separately. The value of the crops per acre for the entire rotation is arrived at by allowing barley at 48 cents per bushel, oats at 34 cents per bushel and wheat at 80 cents per bushel.

INDIAN HEAD.

APPLICATION of Barnyard Manure for Barley.

Plot No.	Application of manure.	Days to mature.	Yield of wheat per acre on summer-fallow.		Days to mature.	Yield of barley per acre on wheat stubble.		Value of crops per acre for entire rotation.		Average for three years.	
			Bush.	Lb.		Bush.	Lb.	$	cts.	$	cts.
1	Apply, in winter, green manure (cut straw) on first-year stubble, disc in...........	114	46	..	84	41	32	56	80	54	67
3	Top dress, with spreader, barley sown on first-year stubble......................	114	46	..	84	42	24	57	20	60	62
5	No manure, plough first-year stubble in autumn................................	114	40	40	84	40	..	51	74	56	69
6	Apply on first-year stubble, plough under in autumn...........................	114	47	20	84	37	24	55	87	59	21
7	Apply on first-year stubble, plough under in spring............................	114	47	20	84	37	24	55	87	55	91
8	No manure, disc first-year stubble in autumn................................	114	40	..	84	33	16	48	00	52	50
9	No manure, burn first-year stubble.......	114	30	..	84	32	24	39	60	50	01

APPLICATION of Barnyard Manure for Barley.

Plot No.	Application of manure.	Days to mature.	Yield of barley per acre on summer-fallow.		Days to mature.	Yield of oats per acre on stubble.		Value of crops per acre for entire rotation.		Average for three years.	
			Bush.	Lb.		Bush.	Lb.	$	cts.	$	cts.
2	Apply, in winter, green manure (cut straw) on summer-fallow, sow barley on summer-fallow......................	84	51	32	92	44	24	40	00	49	87
4	Top-dress, with spreader, barley sown on summer-fallow....	84	60	..	92	27	02	38	00	48	79

APPLICATION OF BARNYARD MANURE FOR OATS.

In this experiment a three-year rotation is also followed:—

First year.—Summer-fallow.

Second year.—Wheat or oats, as indicated.

Third year.—Oats or barley, as indicated.

As in the previous experiment, the different cropping systems followed make it necessary to consider plots 2 and 4 apart from the remainder. In order to make a clear comparison of the results of different methods of applying manure, the same valuations for wheat, oats and barley are used as in the previous experiment.

INDIAN HEAD.

APPLICATION of Barnyard Manure for Oats.

Plot No.	Application of manure.	Days to mature.	Yield of wheat per acre on summer-fallow.		Days to mature.	Yield of oats per acre on wheat stubble.		Value of crops per acre for entire rotation.		Average for three years.	
			Bush.	Lb.		Bush.	Lb.	$	cts.	$	cts.
1	Apply, in winter, green manure (cut straw) on first-year stubble, disc in	114	43	20	92	52	32	62	67	55	78
3	Top-dress, with spreader, oats sown on first-year stubble	114	36	40	92	56	16	48	54	57	51
5	No manure, plough first-year stubble in autumn	114	46	40	92	54	04	55	74	59	37
6	Apply on first-year stubble, plough under in autumn	114	34	..	92	50	20	44	40	57	70
7	Apply on first-year stubble, plough under in spring	114	39	20	92	52	32	49	47	59	64
8	No manure, disc first-year stubble in autumn	114	30	40	92	31	26	35	34	57	03
9	No Manure, burn first-year stubble	114	33	20	92	31	26	37	47	53	91

APPLICATION of Barnyard Manure for Oats.

Plot No.	Application of Manure.	Days to mature.	Yield of Oats per acre on summer-fallow.		Days to mature.	Yield of Barley per acre on oat stubble.		Value of crops per acre for entire rotation.		Average for three years.	
			Bush.	Lb.		Bush.	Lb.	$	cts.	$	cts.
2.	Apply, in winter, green manure (cut straw) on summer-fallow, sow oats on summer-fallow	92	76	16	84	30	00	40	40	43	86
4.	Top-dress, with spreader, oats sown on summer-fallow	92	77	22	84	32	24	42	00	47	47

INDIAN HEAD.

GREEN MANURING.

The rotation followed is:—

First year.—Summer-fallow or green crop turned under.

Second year.—Wheat.

Third year.—Wheat.

Again, to be able to make a proper comparison, a value is placed on the oats and wheat. Oats are valued at 34 cents per bushel, and wheat at 80 cents per bushel.

GREEN Manuring for Wheat followed by Oats.

Plot No.	Treatment of land year previous to Wheat.	Days to mature.	Yield of Wheat per acre.		Days to mature.	Yield of Oats per Acre on wheat stubble.		Value of crop per acre for entire rotation.	Average for three years.
			Bush.	Lb.		Bush.	Lb.	$ cts.	$ cts.
1.	Summer-fallow	116	33	20	92	41	06	40 67	48 54
2.	Peas, ploughed under early in July	116	33	20	98	47	02	42 67	49 38
3.	Peas, ploughed under when in bloom	116	33	20	98	44	24	41 87	48 13
4.	Tares, ploughed under late July	116	38	40	98	47	02	46 94	52 41
5.	Summer-fallow, barnyard manure, 12 tons per acre, applied on summer-fallow	116	42	40	92	54	04	52 54	54 74
6.	Summer-fallow	116	34	00	92	47	02	43 20	51 66

SEED-BED PREPARATION.

This experiment is also carried on under a three-year rotation:

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Oats.

The land is summer-fallowed by ploughing in June, about 6 inches deep, packing, harrowing and cultivating as necessary throughout the season to keep down the weeds; the only difference in preparing the land for seed being in the following spring, when it is given the treatment as outlined in the table following:—

PREPARATION of Seed-bed for Wheat.

Plot No.	Preparation given.	Days to mature.	Yield of Wheat per acre, 1914.		Average.	
			Bush.	Lb.	Bush.	Lb.
1	"Poor" (harrowed only once)	114	43	20	35	06
2	"Good" (harrowed twice)	114	42	40	37	53
3	"Extraordinary" (harrowed three times and packed)	114	43	20	42	00

INDIAN HEAD.

PREPARING SEED-BED FOR OATS.

In preparing a seed-bed for oats, the land is fall ploughed, packed and harrowed. The following spring it is given the treatment as outlined in the table following:—

PREPARATION of Seed-bed for Oats.

Plot No.	Preparation given.	Days to mature.	Yield of Oats per acre, 1914.		Average.	
			Bush.	Lb.	Bush.	Lb.
1....	"Poor" (harrowed twice)	92	62	12	77	02
2....	"Good" (harrowed three times)	92	65	30	74	30
3....	"Extraordinary" (harrowed four times and packed)	92	68	08	86	09

SOIL PACKERS.

In this experiment a three-year rotation is also followed:—

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.

In the third year, plots 1 to 11 are ploughed in the spring, while plots 11 to 25 are ploughed in the fall. From a careful analysis of this table it will be found that the subsurface packer gives best results when used immediately after the plough, and the surface packer when used immediately after the seeder. The harrow after the packer has also increased the yield.

SOIL PACKING for Wheat following Summer-fallow.

Plot No.	Cultural Treatment given.	Days to mature.	Yield of Wheat per acre, 1914.		Average.	
			Bush.	Lb.	Bush.	Lb.
1....	Harrow, seed	111	36	40	39	30
2....	" " surface pack	111	43	20	41	.00
3....	" " " harrow	111	47	20	41	00
4....	" " subsurface pack	111	40	40	40	45
5....	" " " harrow	111	46	00	43	10
6....	" " combination pack	111	34	40	39	35
7....	" " " harrow	111	34	00	39	55
8....	Surface pack, seed, surface pack	111	34	40	43	30
9....	Subsurface pack, seed, subsurface pack	111	40	00	46	40
10....	Combination pack, seed, combination pack	111	40	00	47	10
11....	Surface pack, harrow, seed	111	34	40	46	20
12....	Subsurface pack, harrow, seed	111	36	40	44	00
13....	Combination pack, harrow, seed	111	36	40	43	50
14....	Harrow, seed	111	31	20	39	30
15....	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed	111	36	40	42	00
16....	Plough for summer-fallow, subsurface, pack, cultivate; next spring, smoothing harrow, seed	111	38	00	44	20
17....	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed	111	39	20	43	00
18....	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed, surface pack	111	36	40	42	20
19....	Plough for summer-fallow, subsurface pack, cultivate; next spring smoothing harrow, seed, subsurface pack	111	40	00	52	00
20....	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed, combination pack	111	40	00	49	30
21....	Harrow, seed	111	36	40	49	30
22....	" " harrow when 6 inches high	111	38	40	48	30
23....	" " surface pack when 6 inches high	111	38	40	45	50
24....	" " roll when 6 inches high	111	40	00	45	40
25....	" "	111	39	20	46	30

INDIAN HEAD.

SOIL PACKING for Wheat Sown on Spring and Fall Ploughed Stubble Land.

Plot No.	Cultural Treatment given.	Days to mature	Yield of Wheat per acre, 1914.		Average.	
	Spring Ploughed.		Bush.	Lb.	Bush.	Lb.
1...	Harrow, subsurface pack, harrow, seed	113	26	40	29	35
2...	" surface pack, harrow, seed	113	28	00	35	15
3...	" combination pack, harrow, seed	113	32	00	39	15
4...	" subsurface pack, harrow, seed, subsurface pack	113	24	40	35	55
5...	Harrow, surface pack, harrow, seed, surface pack	113	31	20	41	25
6...	Harrow, combination pack, harrow, seed, combination pack	113	32	40	42	15
7...	" seed, harrow	113	25	20	32	05
8...	" seed, surface pack	113	20	40	32	05
9...	" seed, subsurface pack	113	32	00	37	45
10...	" seed, combination pack	113	29	20	34	55
11...	Harrow, seed	113	28	00	30	25
	Fall Ploughed.					
12...	No packer, harrow, seed	113	32	00	30	15
13...	Subsurface pack in fall, seed in spring	113	30	40	27	55
14...	Subsurface pack in spring, then seed	113	26	40	20	46
15...	Subsurface pack in spring, after seeding	113	32	00	24	20
16...	Surface pack in fall, seed in spring	113	39	20	32	13
17...	Surface pack in spring, then seed	113	33	20	29	35
18...	Surface pack in spring, after seeding	113	28	00	30	25
19...	Combination pack in fall, seed in spring	113	39	20	37	50
20...	Combination pack in spring, then seed	113	28	00	37	55
21...	Combination pack in spring, after seeding	113	30	40	37	00
22...	No packer, harrow, seed	113	26	40	31	45
23...	Surface pack in fall, seed, surface pack	113	25	20	32	35
24...	Subsurface pack in fall, subsurface pack	113	28	00	30	55
25...	Combination pack in fall, seed, combination pack	113	28	00	29	35

DEPTH OF SEEDING.

This experiment is conducted on a three-year rotation:—

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Oats.

The first year wheat stubble is ploughed in the fall and then packed and harrowed.

DEPTH of Seeding Wheat.

Plot No.	Depths sown.	Days to mature.	Yield of wheat per acre, 1914.		Average.	
			Bush.	Lb.	Bush.	Lb.
1	1 inch deep	117	32	40	43	35
2	2 inches deep	117	28		43	40
3	3 inches deep	117	38		44	15
4	4 inches deep	117	34		44	15

Depth of Seeding Oats.

Plot No.	Depths sown.	Days to mature.	Yields of oats per acre, 1914.		Average.	
			Bush.	Lb.	Bush.	Lb.
1	1 inch deep	94	62	12	81	06
2	2 inches deep	94	64	24	81	16
3	3 inches deep	94	50	20	85	18
4	4 inches deep	94	48	08	85	30

COMMERCIAL FERTILIZERS.

In the spring of 1914 the commercial fertilizers in the following experiments were applied on summer-fallow land, and all planted to corn. The frost of August 9, which completely killed the corn, would to a certain extent affect the yield; however, the comparision should still be useful. It will be noted that the yield has been slightly increased by the use of the different fertilizers.

Commercial Fertilizers.

Plot No.	Fertilizer Treatment.	Yield of corn per acre.	
		Tons.	Lb.
1	Check. No fertilizer	7	1,200
2	N. Eight pounds nitrate of soda	8	1,600
3	P_2O_5. Fifteen pounds Super hosphate	9	1,200
4	K_2O. Five pounds muriate of potash	8	1,600
5	Check. No fertilizer	8	400
6	N. P_2O_5 K_2O	10	400
7	N. P_2O_5	9	
8	N. K_2O	8	800
9	P_2O_5 K_2O	7	
10	Check. No fertilizer	6	400
11	Basic Slag, 25 pounds	6	1,600
12	Clover in place of grass	5	1,600
13	Clover in place of grass	6	800
14	Barnyard manure, 16 tons per annum	6	1,200
15	Barnyard manure, 8 tons per annum	6	400
16	Check. No fertilizer	4	1600

Indian Head.

UNDERDRAINING.

In this experiment the regular one-fortieth acre plots are used. The plots are 16 feet wide and drains in plots 3 and 7 run under the centre of the plots. These drains did not discharge any water of any account during the summer, as the season was very dry.

UNDERDRAINING.

Plot No.		Days.	Yield of wheat per acre.	
			Bush.	Lb.
1	No drainage	116	36	
2	No drainage	116	40	
3	Well 4 feet by 4 feet by 6 feet deep, drain 3 feet deep	116	40	40
4	No drainage	116	40	40
5	No drainage	116	39	20
6	No drainage	116	40	
7	Well 4 feet by 4 feet by 6 feet deep, drain 4 feet deep	116	38	
8	No drainage	116	37	20
9	No drainage	116	35	20

DRAINING.

A large slough in the centre of one of the fields was drained last season by digging a ditch shallow and wide so that the farm machinery could be driven through it. This ditch was dug with the ordinary road grader and gas tractor. It would seem to be an economical method of draining these low places in the Farm.

COUCH GRASS ERADICATION.

Three methods of eradicating couch grass were started in 1914. Field No. 1 was ploughed about 7 inches deep the first week in June, packed, harrowed, and seeded with barley at the rate of 3 bushels per acre. Field No. 2 was ploughed as for summer-fallow in early July, about 6 inches deep, and cultivated and disced throughout the season to keep the grass from growing. Field No. 3 was seeded down, and it was the intention to take hay off, pasture this summer and break it up the following season by ploughing in June and back-setting. In field No. 1 little success can be reported, as the season was so dry the barley did not germinate quickly and the grass in many places crowded it out. In field No. 2 a large amount of roots was gathered off and burned up, and in the fall practically no green grass could be seen.

ROADMAKING.

The plank road-drag was again used on the farm roads and driveway this season. By the use of this and the ordinary drag harrow the roads were kept in fair condition throughout the whole summer.

SHELTERING MACHINERY.

As it was necessary to purchase some new machinery, an experiment was planned whereby two machines exactly alike were purchased. One of these was kept under shelter when not in use and the other was left outside. An account was opened for each machine, showing the number of hours it had operated, number of acres worked, and also the amount of repairs required. At the end of ten years some valuable information should be gleaned from this experiment.

INDIAN HEAD.

EXPERIMENTAL STATION FOR CENTRAL SASKATCHEWAN, ROSTHERN, SASK.

REPORT OF THE SUPERINTENDENT, WM. A. MUNRO, B.A., B.S.A.

WEATHER CONDITIONS.

The season of 1914 opened favourably, and seeding was completed in good time. Growth was excellent until the middle of June, and crops promised a higher yield than the average. However, the drought of June and July affected all crops, especially those put in under any but the most favourable conditions, and at harvest time much of the grain was so poorly developed that it was not cut.

In order to illustrate the relation and importance of the amount of precipitation, during June and July especially, to the yield of grain, records are given for the past four seasons. From the table it will be noted that the precipitation during the growing season of 1914 was much below the average, which caused the correspondingly low yield of grain.

PRECIPITATION for the past four Growing Seasons, April 1 to August 15.

Month.	Year.				Average 4 years.
	1911	1912	1913	1914	
	Inches.	Inches.	Inches.	Inches.	Inches.
April	0·86	0·67	0·26	0·63	0·61
May	2·38	2·15	1·26	1·96	1·94
June	3·55	2·81	1·87	2·00	2·56
July	2·89	5·25	3·80	1·40	3·33
August	0·43	0·23	2·24	0·13	0·76
Total	10·11	11·11	9·43	6·12	9·20

WEATHER OBSERVATIONS taken at Rosthern, Experimental Station, 1914.

Month.	Temperature F.			Total Precipitation.	Total Sunshine.
	Highest.	Lowest.	Mean.		
	°	°	°	Inches.	Hours.
January	35·5	—27·8	1·5	0·65	97·9
February	39·0	—47·6	—11·05	0·00	146·9
March	42·3	—15·9	17·9	0·55	149·1
April	69·1	5·3	35·8	0·63	209·7
May	80·1	22·2	49·8	1·96	264·3
June	84·2	33·3	58·7	2·00	308·3
July	93·8	41·2	67·5	1·40	339·6
August	87·0	32·8	60·0	1·12	273·9
September	79·3	30·1	50·9	0·97	203·0
October	81·2	16·7	42·5	1·57	145·7
November	49·9	—20·0	21·7	1·20	100·0
December	23·8	—31·8	1·1	0·52	49·5
Total				12·57	2,287·9
Average for years 1911-12-13				17·47	2,135·9
Total for six growing months, April to September				8·08	1,598·8
Average for six growing months, 1911-12-13				14·25	1,414·

ROSTHERN.

ROTATION OF CROPS.

Four rotations have been in operation at this station since 1911. The area of each field is 2 acres, and a careful record is kept of the cost to operate, including seed and fertilizer applied, as well as the value of the returns in grain, hay and roots.

The field conditions are as nearly like those of the ordinary farm as is possible under our circumstances, and the results are approximately what an average farmer might expect on his own farm. Following the outline of the rotations, a tabular record is herewith given for all the rotations now in operation. The fixed values used in calculating the results are given on page 245 of this report.

ROTATION "C" (THREE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

This is a three-year rotation which is inexpensive to operate, as grain only is grown, and nothing else in the nature of fertilizer is added. Such a rotation is only recommended for new, clean, rich land, and cannot be carried on indefinitely because it will deplete the soil of fertility, and also will not keep weeds under control.

ROTATION "J" (SIX YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Oats, seeded down.

Fifth year.—Hay.

Sixth year.—Pasture.

This rotation could be used to advantage by the farmer beginning live-stock raising, as hay and oats are provided for feed, and wheat for sale. A small amount of manure is returnable to the soil but as no hoed crops are included in the rotation it will be difficult to control weeds.

ROTATION "P" (EIGHT YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat or coarse grain.

Fourth year.—Summer-fallow.

Fifth year.—Hoed crops or legumes.

Sixth year.—Barley. Seeded down.

Seventh year.—Hay.

Eighth year.—Pasture.

This is a mixed-farming rotation, and as yet involves too many fields for the average farmer of this district. This difficulty could be overcome, however, by a slight re-arrangement of the rotation wherein the crops would succeed each other as follows: summer-fallow; hoed and legume crops; wheat; wheat, oats, or barley, seeded down; hay; hay.

ROTATION "R" (NINE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Hoed crops or legumes manured at the rate of 15 tons per acre.

Third year.—Wheat.

Fourth year.—Oats.

Fifth year.—Summer-fallow.

Sixth year.—Wheat.

Seventh year.—Oats, seeded down.

Eighth year.—Hay.

Ninth year.—Pasture.

This rotation, like the previous one, includes every crop required for mixed farming purposes, and presents the same difficulty in that it extends over too many years and involves too many fields. These present drawbacks should be eliminated as mixed farming becomes more prominent.

ROSTHERN.

.ROTATION "C"

Rotation year.	Crops. 1913.	Crops. 1914.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
			Acres.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
2nd...	Fallow.........	Wheat.........	2	4 00	6 24	2	38	.....	1¾	7½	2	.....
3rd...	Wheat.........	Wheat.........	2	4 00	6 06	2	38	.....	1¾	7	2	.....
1st...	Wheat.........	Fallow.........	2	4 00	1 20	.....	.....	.....	1½	9¾	1	.....
	Aggregate....................		6	12 00	13 50	4	76	.....	5	24¼	5	.....
	Average per acre..............		.....	2 00	2 25	·66	13	.....	·83	4·04	·83	.....

ROTATION "J"

Rotation year.	1913.	1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour Hours.	Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
4th...	Wheat.........	Oats..........	2	4 00	6 40	4	76	.....	3	2½	1	.....
5th...	Oats..........	Hay..........	2	4 00	7 70	4	76	.....	3	.....	.....	.....
6th...	Hay..........	Hay..........	2	4 00	7 70	4	76	.....	3	5	1	.....
1st...	Hay..........	Fallow.........	2	4 00	1 20	.....	.....	.....	.....	11	1	.....
2nd...	Fallow.........	Wheat.........	2	4 00	6 18	.....	.....	.....	2¾	6½	1	.....
3rd...	Wheat.........	Wheat.........	2	4 00	6 12	2½	48	.....	2¾	6¾	2	.....
	Aggregate....................		12	24 00	35 30	14·5	2 76	.....	14·5	31·75	6	.....
	Average per acre..............		.....	2 00	2 94	1·2	23	.....	1·21	2·65	·5	.....

ROTATION "P"

Rotation year.	1913.	1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour Hours.	Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
4th...	Wheat.........	Fallow.........	2	7 33	1 20	.....	.....	.....	.....	10·5	1	.....
5th...	Fallow.........	Roots.........	2	7 33	5 65	237	45 03	5	5·5	1	1	.....
6th...	Roots.........	Barley.........	2	7 33	5 80	3	57	.....	2	6	1	.....
7th...	Barley.........	Hay.........	2	7 33	8 06	3	57	.....	.....	1·75	.....	.....
8th...	Hay.........	Hay.........	2	7 33	7 70	1	19	.....	2·75	4·5	1	.....
1st...	Hay.........	Fallow.........	2	7 33	1 20	.....	.....	.....	.....	10·25	1	.....
2nd...	Fallow	Wheat	2	7 33	6 18	2	38	.....	1·75	7·5	1	.....
3rd...	Wheat	Wheat.........	2	7 33	6 18	2	38	.....	1·75	7·0	2	.....
	Aggregate....................		16	58 64	41 97	248	47 12	5	13·75	48·50	8	
	Average per acre..............		.....	3 66	2 62	15·5	2 95	·31	·86	3·03	5	

ROTATION "R"

Rotation year.	1913.	1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour Hours.	Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
4th...	Wheat.........	Oats.........	2	7 33	6 68	2	38	.....	1·75	7·5	2	.....
5th...	Oats.........	Fallow.........	2	7 33	1 20	.....	.....	.....	.....	9·75	2	.....
6th...	Fallow.........	Wheat.........	2	7 33	6 18	2	38	.....	1·75	7·5	1	.....
7th...	Wheat	Oats.........	2	7 33	6 62	3	57	.....	2	6·25	1	.....
8th...	Oats.........	Hay.........	2	7 33	7 70	5	95	.....	3	.....	.....	.....
9th...	Hay.........	Hay.........	2	7 33	7 70	5	95	.....	3·5	4·5	1	.....
1st...	Hay.........	Fallow.........	2	7 33	1 20	.....	.....	.....	.....	11·25	1	.....
2nd...	Fallow	Corn.........	2	7 33	5 55	84	15 96	4·5	2	9·0	1	.....
3rd...	Corn.........	Wheat.........	2	7 33	6 18	2	38	.....	1·75	6·0	3	.....
	Aggregate....................		18	65 97	49 01	103	19 57	4·5	15·75	61·75	12	
	Average per acre..............		.....	3 67	2 72	5·7	1 08	·25	·87	3·43	·66	

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IN RAISING CROP.							PARTICULARS OF CROP.						
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cents	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
(Three years' duration).													
4 62	4 55	19 79	9 89	30·3			3,912	5,114			54 56	27 28	17 39
4 42	2 90	17 76	8 88	42·8			2,493	4,727			35 56	17 78	8 90
4 99		10 19	5 10										−5 10
14 03	7 45	47 74									90 12		
2 34	1 24		7 96									15 02	7 06
(Six years' duration).													
2 52	3 28	16 96	8 48	20·7			2,797	4,253			32 13	16 07	7 59
68		13 14	6 57		2 92				2,250		11 25	5 63	− 94
4 55		17 01	8 50						2,440		12 20	6 10	−2 40
4 99		10 19	5 10										−5 10
3 68	4 18	18 04	9 02	30			3,584	4,410			50 00	25 00	15 98
4 58	2 31	17 49	8 75	56			1,987	3,825			28 31	14 15	5 40
21 00	9 77	92 83									133 89		
1 75	81		7 73									11 16	3 43
(Eight years' duration.)													
4 78		13 31	6 65										−6 65
4 11		62 12	31 06							46,228	69 34	34 67	3 61
3 62	3 78	21 10	10 55	27·2			3,622	8,498			45 70	22 85	12 30
72		16 68	8 34		3 70				4,508		22 51	11 27	2 93
3 25		18 47	9 24		10 53				3,590		17 95	8 97	−0 27
4 68		13 21	6 60										−6 60
4 11	3 75	21 75	10 88	40			3,219	4,411			44 85	22 85	11 97
4 43	2 38	20 70	10 35	60·3			2,035	4,950			29 68	14 84	4 49
29 70	9 91	187 34									230 06		
1 86	62		11 71									14 43	2 72
(Nine years' duration.)													
4 56	4 80	23 75	11 87	19·8			4,084	4,360			45 20	22 60	10 73
4 95		13 48	6 74										−6 74
4 14	4 62	22 65	11 32	34·3			3,964	5,325			55 30	27 65	16 33
3 72	3 92	22 16	11 08	22·6			3,334	4,570			37 82	18 91	7 83
1 02		17 00	8 50						4,538		22 69	11 35	2 85
3 51		19 49	9 75						3,020		15 10	7 55	−2 20
5 09		13 62	6 81										−6 81
6 07		34 91	17 45							17 920	26 88	13 44	−4 01
4 50	5 32	23 71	11 86	31·2			4,547	8,023			64 81	32 40	20 54
37 56	18 66	190 77									267 80		
2 09	1 03		10 59									14 87	4 28

ROSTHERN.

CULTURAL INVESTIGATION WORK.

The following are the results of the various soil cultural experiments under way:—

PRAIRIE BREAKING.

In this experiment, five plots are broken each year according to the directions given below. The sequence of the crops is as follows:—

First year.—Broken and treated as indicated below.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Summer-fallow.

Fifth year.—Wheat.

BROKEN 1911-12-13.

Plot No.	Treatment when breaking.	Broken in 1911.		Broken in 1912.		Broken in 1913.
		Yield of wheat per acre.				
		1912.	1913.	1913.	1914.	1914.
		Lb.	Lb.	Lb.	Lb.	Lb.
1	Plough 3 inches to 4 inches early spring, pack, double-disc, harrow, double-disc, sow to peas and oats....	2,040	1,680	3,120	1,380	1,500
2	Plough 3 inches to 4 inches early spring, pack, double-disc, harrow, double-disc, sow to flax..............	2,000	2,080	2,480	1,960	1,220
3	Plough 3 inches to 4 inches early spring, pack, double-disc, harrow, sow to flax..............................	1,680	2,280	2,280	1,240	1,400
4	Break early June, 4 inches to 5 inches, keep cultivated from day broken..................................	2,440	1,880	2,360	1,620	1,840
5	Break early June, 2 inches to 3 inches, roll, backset early September, keep cultivated from day broken.	2,160	2,960	2,220	1,500	1,780

DEPTH OF PLOUGHING WHEAT STUBBLE TO BE SOWN TO OATS.

The wheat stubble was ploughed in the spring of 1913 for the oat crop of 1913, and another set of plots in the spring of 1914 for the oat crop of 1914.

DEPTH of Ploughing Wheat Stubble to be Sown to Oats.

Plot No.	Depth of Ploughing.	Yield of Oats per acre 1913.	Yield of Oats per acre 1914.
		Lb.	Lb.
1	Ploughed 3 inches deep..	3,400	1,960
2	" 4 " "	3,440	2,120
3	" 5 " "	4,160	2,072

ROSTHERN.

DEPTH OF PLOUGHING SUMMER-FALLOW TO BE SOWN TO WHEAT.

The summer-fallow for the crop of 1913 was ploughed on June 8, 1912, and for the crop of 1914 on June 2, 1913.

Depth of Ploughing Summer-Fallow to be Sown to Wheat.

Plot No.	Depth of Ploughing Summer-fallow.	Yield of wheat per acre 1913.	Yield of wheat per acre 1914.
		Lb.	Lb.
1	Ploughed 3 inches deep	2,080	1,600
2	" 4 " "	2,160	1,720
3	" 5 " "	2,240	1,560
4	" 6 " "	2,360	1,440
5	" 7 " "	2,280	1,460
6	" 8 " "	2,400	1,500
7	" 5 " " and subsoiled 4 inches	2,600	1,600
8	" 6 " " " " 4 "	2,560	1,680
9	" 7 " " " " 4 "	2,840	1,620
10	" 8 " " " " 4 "	2,600	1,780

DEPTH OF PLOUGHING SOD.

Western rye grass sod was ploughed July 19, 1912, for a crop of wheat in 1913, and on August 7 for crop of 1914.

Depth of Ploughing Sod to be Sown to Wheat.

Plot No.	Depth of Ploughing Sod.	Yield of wheat per acre 1913.	Yield of wheat per acre 1914.
		Lb.	Lb.
1	Ploughed 3 inches deep	2,440	920
2	" 4 " "	2,640	940
3	" 5 " "	2,480	1,060

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SUMMER-FALLOW TREATMENT.

Seventeen plots were summer-fallowed as given below and sown to wheat followed by oats.

TREATMENT of Summer-fallow to be Sown to Wheat Followed by Oats.

Plot No.	Treatment of summer-fallow previous to wheat.	Yield per Acre.				
		Wheat 1912.	Oats 1913.	Wheat 1913.	Oats 1914.	Wheat 1914.
		Lb.	Lb.	Lb.	Lb.	Lb.
1	Plough 4 inches, June, pack if necessary and practicable, cultivate as necessary	2,820	3,080	2,000	2,800	1,900
2	Plough 6 inches, June, pack if necessary and practicable, cultivate as necessary	2,640	4,120	2,320	2,580	1,940
3	Plough 8 inches, June, pack if necessary and practicble, cultivate as necessary	2,080	4,200	2,240	2,900	2,040
4	Plough 4 inches, June, cultivate. Plough 4 inches, September, harrow	2,040	4,320	2,000	2,460	1,980
5	Plough 6 inches, June, cultivate. Plough 6 inches, September, harrow	2,160	3,800	1,920	2,460	1,800
6	Plough 8 inches, June, cultivate. Plough 8 inches, September, harrow	2,160	4,240	1,920	2,700	1,640
7	Plough 6 inches, June, cultivate. Plough 4 inches, September, harrow	1,960	3,400	1,920	3,160	1,680
8	Plough, 4 inches, June cultivate. Plough 6 inches, September, harrow	2,280	4,280	1,680	2,520	1,560
9	Plough 4 inches, June, early as possible, cultivate. Plough 6 inches September	2,840	4,000	1,560	2,500	1,920
10	Plough 5 inches, June, seed to rape or other green forage crop and pasture off	1,880	3,720	1,280	2,420	1,880
11	Plough 6 inches, May 15 harrow and pack if necessary, cultivate as necessary	2,200	4,040	2,240	2,620	2,020
12	Plough 6 inches, June 15, harrow and pack if necessary, cultivate as necessary	2,640	4,080	2,400	2,920	2,320
13	Plough 6 inches, July 15, harrow and pack if necessary, cultivate as necessary	2,400	3,800	2,440	3,060	2,200
14	Fall cultivate before summer-fallowing. Plough 6 inches, June, harrow and pack	2,280	4,000	2,600	3,360	2,320
15	Fall plough 4 inches before summer-fallowing. Plough 6 inches, June, harrow and pack	2,640	3,800	2,680	3,040	2,200
16	Plough 6 inches June, pack, cultivate as necessary	2,560	3,680	2,440	2,940	2,080
17	Plough 6 inches, June, no packing, otherwise same as other plots	2,600	3,880	2,680	3,020	2,120

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GREEN MANURING.

This experiment shows more than any other at the Station the beneficial effect of barnyard manure. Throughout the season, plot 5, on which barnyard manure was applied for wheat, stood from 2 to 4 inches higher than the other plots, and a similar advantage was noted on the succeeding oat crops.

Green Manuring for Wheat followed by Oats.

Plot No.	Treatment of land year previous to wheat.	Yield per Acre.				
		Wheat 1912.	Oats. 1913.	Wheat. 1913.	Oats. 1914.	Wheat. 1914.
		Lb.	Lb.	Lb.	Lb.	Lb.
1	Summer-fallow	2,400	3,200	2,720	2,380	1,840
2	Peas, ploughed under early in July	2,320	3,680	2,680	2,200	1,820
3	Peas, ploughed under when in bloom	2,000	3,880	2,440	2,160	1,720
4	Tares, ploughed under late July	2,800	4,440	2,520	2,120	1,560
5	Summer-fallow, barnyard manure 12 tons per acre applied on summer-fallow in September	3,440	4,800	3,680	2,380	2,300
6	Summer-fallow	2,480	4,000	2,280	2,140	1,780

DEPTHS OF SEEDING.

Oats and wheat were sown at depths varying from 1 to 4 inches.

Depths of Seeding Wheat.

Plot No.	Depth Sown.	Yield of Wheat per acre.	
		1913.	1914.
		Lb.	Lb.
1	1 inch deep	2,720	1,720
2	2 inches deep	2,760	1,840
3	3 " "	2,560	1,800
4	4 " "	2,120	1,920

Depths of Seeding Oats.

Plot No.	Depth Sown.	Yield of Oats per acre.	
		1913.	1914.
		Lb.	Lb.
1	1 inch deep	3,800	3,040
2	2 inches deep	3,600	3,000
3	3 " "	4,320	3,920
4	4 " "	4,360	1,960

ROSTHERN.

EXPERIMENTAL STATION FOR NORTHWESTERN SASKATCHEWAN, SCOTT, SASK.

REPORT OF THE ACTING SUPERINTENDENT, M. J. TINLINE, B.S.A.

WEATHER AND CROP CONDITIONS, 1914.

The summer of 1914 has been one of the most disastrous to crop production that this section of Saskatchewan has ever experienced. Less rain than usual fell during the summer of 1913, and very little snow fell during the winter of 1913-14. This left the soil with a small amount of moisture to withstand the severe drought to which it was subjected during the past season. The drought, together with the winds which prevailed during the latter part of July, hastened the crops to maturity, the first grain being cut on July 31. The light harvest, while delayed considerably by the August and September rains, was threshed in sufficient time to allow for a much larger acreage of fall-ploughing than usual, before the ploughs were stopped, on November 5, by the frost.

Some Weather Observations taken at Scott Experimental Station, 1914.

Month.	Temperature F.			Precipitation.				
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall	Total.	Heaviest in 24 hours.	Total Sunshine.
	°	°	°	Inches.	Inches.	Inches.	Inches.	hours.
January	1·91	38·0	—40·1			·65		96·6
February	5·70	37·2	—46·6			·03		128·5
March	19·37	44·0	—21·9			·20		157·9
April	37·8	76·5	9·1	1·36		1·36	·48	184·5
May	49·0	82·0	18·4	1·05	1·0	1·15	·22	295·4
June	56·9	85·0	34·1	2·37		2·37	·46	211·0
July	67·0	96·8	35·2	1·80		1·80	·95	309·0
August	59·5	90·5	30·0	1·41		1·41	·55	235·1
September	55·2	80·0	28·2	3·46		3·46	2·20	192·8
October	41·13	70·1	18·2	3·17		3·17	1·75	143·7
November	23·69	51·8	—17·3		6·0	·60	·60	100·4
December	2·57	24·8	—23·3		18·0	1·80	·60	26·3
Total for year				14·62		18·00		2,081·2
Total for six growing months, April to September						11·55		1,427·8

FIELD CROP YIELDS.

Variety.	Area.	Yield per acre
	Acres.	Bush.
Wheat—		
Marquis	16	14
Pioneer	4	14
Prelude	4	11·6
Oats—		
Victory	1	39·5
Barley—		
O. A. C. No. 21	1	17
Peas—		
Arthur	4·7	22

COST OF PRODUCTION OF FIELD CROPS.

The investigation into the cost of producing field crops has been continued this past year. In computing the cost of production, fixed values, as outlined on page 245 of this report have been used.

COST OF PRODUCING WHEAT ON PLOT "A."

Wheat is grown on this plot continuously.

Number of acres, 1.

Rent of land at $2 per acre	$ 2 00
Ploughing in fall, 2⅝ hours, 4-horse team at 48 cents per hour	1 28
Packing after ploughing, ⅝ hour, 2-horse team at 34 cents per hour	23
Harrowing after packing, ¼ hour, 4-horse team at 48 cents per hour	12
Harrowing in spring, ½ hour, 4-horse team at 48 cents per hour	24
Seed, 1¾ bushels at 85 cents per bushel	1 50
Sowing, 1 1/12 hours, 2-horse team at 34 cents per hour	37
Packing after seeding, 7/12 hour, 2-horse team at 34 cents per hour	20
Harrowing after packing, ¼ hour, 4-horse team at 48 cents per hour	12
Cutting, 1 hour, 4-horse team at 48 cents per hour	48
Twine, 30 cents per acre	30
Use of machinery, 60 cents per acre	60
Stooking, 1 hour manual labour at 19 cents per hour	19
Threshing, 4 bushel of grain at 7 cents per bushel	28

Yield of grain per acre 231 pounds. Yield of straw per acre 1,239 pounds.
Total cost of produce (3·85 bushels of grain), (1,239 pounds of straw), $7.91.
Cost to produce 1 bushel of grain, $1.98.
Cost to produce 1 ton of straw, $12,77.

COST OF PRODUCING WHEAT ON ROTATION "C.'

This is a three-year rotation: first year, summer-fallow; second year, wheat; third year, wheat.

Year 2.—Wheat after Summer-fallow.

Number of acres, 1½.

Rent of land at $2 per acre	$3 00
Harrowing in spring, 1 hour, 4-horse team at 48 cents per hour	48
Seed, 2⅝ bushels at 85 cents per bushel	2 25
Sowing, 1⅝ hours, 2-horse team at 34 cents per hour	56
Packing after seeding, ⅝ hours, 2-horse team at 34 cents per hour	22
Harrowing after grain was up, ⅓ hour, 4-horse team at 48 cents per hour	16
Cutting, 1 1/6 hours, 4-horse team at 48 cents per hour	56
Twine, at 30 cents per acre	45
Use of machinery at 60 cents per acre	90
Stooking, ⅚ hour, manual labour at 19 cents per hour	16
Threshing, 24 bushels at 7 cents per bushel	1 68

Yield of grain per acre, 966 pounds; yield of straw per acre, 1,271 pounds.
Total cost of produce (24 bushels of grain), (1,906 pounds of straw), $10.42.
Cost to produce 1 bushel of grain, 43 cents.
Cost to produce 1 ton of straw, $10.98.

SCOTT.

COST OF PRODUCING WHEAT ON ROTATION "C"—*Concluded.*

Year 3.—Wheat after Wheat.

Number of acres, 1½.	
Rent of land at $2 per acre	$ 3 00
Ploughing in fall, 3½ hours, 4-horse team at 48 cents per hour	1 68
Harrowing in spring, ⅝ hour, 4-horse team at 48 cents per hour	32
Seed, 2⅝ bushels at 85 cents per bushel	2 25
Sowing, 7/12 hour, 2-horse team at 34 cents per hour	54
Packing after seeding, ¾ hour, 2-horse team at 34 cents per hour	25
Cutting, 1½ hours, 4-horse team at 48 cents per hour	72
Twine, 30 cents per acre	45
Use of machinery, 60 cents per acre	90
Stooking, ⅝ hour manual labour at 19 cents per hour	16
Threshing, 16⅜ bushels at 7 cents per bushel	1 15
Yield of grain per acre, 669 pounds; yield of straw per acre, 951 pounds.	
Total cost of produce, (16⅜ bushels grain), (1,426 pounds straw), $11.42.	
Cost to produce 1 bushel of grain, 68 cents.	
Cost to produce 1 ton of straw, $16.02.	

COST OF PRODUCING WHEAT ON ROTATION "J."

This is a six-year rotation: first year, summer-fallow; second year, wheat; third year, wheat; fourth year, oats seeded down with western rye grass 10 pounds, red clover 3 pounds, alfalfa 3 pounds; fifth year, hay; sixth year, pasture.

Year 3.—Wheat after Summer-fallow.

Number of acres, 2⅕.	
Rent of land at $2 per acre	$4 40
Harrowing in spring, 1¾ hours, 4-horse team at 48 cents per hour	84
Seed, 3⅘ bushels at 85 cents per bushel	3 23
Sowing, 1⅝ hours, 2-horse team at 34 cents per hour	62
Packing after seeding, ⅝ hours, 2 horse team at 34 cents per hour	28
Harrowing after seeding, ¾ hours 4-horse team at 48 cents per hour	36
Cutting, 1⅝ hours, 4-horse team at 48 cents per hour	88
Twine, at 30 cents per acre	66
Use of machinery, at 60 cents per acre	1 32
Stooking, 1 hour manual labour at 19 cents per hour	19
Threshing, 51⅓ bushels at 7 cents per bushel	3 60
Yield of grain per acre, 1,408 pounds; yield of straw per acre, 1,335 pounds.	
Total cost of produce (51⅓ bushels grain), (2,938 pounds straw)	16 38
Cost to produce 1 bushel of grain	32
" " 1 ton of straw	11 15

Year 3—Wheat after Wheat.

Number of acres, 2⅕ acres.	
Rent of land at $2 per acre	$ 4 40
Ploughing in fall, 5¼ hours, 4-horse team at 48 cents per hour	2 52
Packing after ploughing, ½ hour, 2-horse team at 34 cents per hour	17
Harrowing after packing, 5/12 hours, 4-horse team at 48 cents per hour	20
Harrowing in spring, 11/12 hours, 4-horse team at 48 cents per hour	44
Seed, 3⅘ bushels at 85 cents per bushel	3 23
Sowing, 2 hours, 2-horse team at 34 cents per hour	68
Harrowing after grain was up, 5/12 hour, 4-horse team at 48 cents per hour	20
Cutting, 15/12 hours, 4-horse team at 48 cents per hour	68
Twine, at 30 cents per acre	66
Use of machinery, at 60 cents per acre	1 32
Stooking, 1 hour manual labour, at 19 cents per hour	19
Threshing, 25 bushels at 7 cents per bushel	1 75
Yield of grain per acre, 682 pounds; yield of straw per acre, 777 pounds.	
Total cost of produce (25 bushels grain), (1,710 pounds straw)	16 44
Cost to produce 1 bushel of grain	66
" " 1 ton of straw	17 48

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COST OF PRODUCING WHEAT ON ROTATION "P."

Duration of rotation, eight years; first year, summer-fallow; second year, wheat; third year, wheat; fourth year, summer-fallow; fifth year, peas; sixth year, barley seeded down (western rye grass, red clover, and alfalfa); seventh year, hay; eighth year, pasture.

Year 2—Wheat after Summer-fallow.

Number of acres, 1½.	
Rent of land at $2 per acre.. .. .. $	3 00
Harrowing in spring, ⅔ hour, 4-horse team at 48 cents per hour.. ..	32
Seed, 2⅝ bushels at 85 cents per bushel..	2 25
Sowing, 1⅙ hours, 2-horse team at 34 cents per hour..	40
Harrowing after seeding, ⅓ hour, 4-horse team at 48 cents per hour.	16
Cutting, 1¼ hours, 4-horse team at 48 cents per hour..	60
Twine, at 30 cents per acre..	45
Use of machinery, at 60 cents per acre..	90
Stooking, 1 hour manual labour at 19 cents per hour..	19
Threshing, 29 bushels at 7 cents per bushel..	2 03
Yield of grain per acre, 1,166 pounds; yield of straw per acre, 1,940 pounds.	
Total cost of produce (29 bushels grain), (3,800 pounds straw)..	10 30
Cost to produce 1 bushel of grain..	36
" " 1 ton of straw..	7 08

Year 3—Wheat after Wheat.

Number of acres, 1⅜.	
Rent of land at $2 per acre..	2 75
Ploughing in fall, 3¼ hours, 4-horse team at 48 cents per hour.. ..	1 56
Packing after ploughing, ⅚ hour, 2-horse team at 34 cents per hour..	28
Harrowing after packing, 5/12 hour, 4-horse team at 48 cents per hour.	20
Harrowing in the spring, ¾ hour, 4-horse team at 48 cents per hour..	36
Seed, 2 5/12 bushels at 85 cents per bushel..	2 07
Sowing, 1 5/12 hours, 2-horse team at 34 cents per hour..	49
Harrowing after seeding, ⅓ hour, 4-horse team at 48 cents per hour..	16
Cutting, 1 5/12 hours, 4-horse team at 48 cents per hour..	68
Twine, at 30 cents per acre..	41
Use of machinery, at 60 cents per acre..	82
Stooking, 1 hour manual labour at 19 cents per hour..	19
Threshing, 11½ bushels at 7 cents per bushel	80
Yield of grain per acre, 498 pounds; yield of straw per acre, 752 pounds.	
Total cost of produce (11½ bushels grain), (1,035 pounds straw).. ..	10 77
Cost to produce 1 bushel of grain..	94
" " 1 ton of straw..	20 81

COST OF PRODUCING WHEAT ON ROTATION "R."

Duration of rotation, nine years: First year, summer-fallow; second year, peas; third year, wheat; fourth year, oats; fifth year, summer-fallow; sixth year, wheat; seventh year, oats seeded down with western rye grass, red clover, and alfalfa; eighth year, hay; ninth year, pasture.

Year 3—Wheat after Peas.

Number of acres, 2⅓.	
Rent of land at $2 per acre.. .. .. $	4 67
Discing in spring, 3⅙ hours, 4-horse team at 48 cents per hour..	1 52
Harrowing in spring, 1½ hours, 4-horse team at 48 cents per hour.. ..	72
Seed, 4 1/12 bushels at 85 cents per bushel..	3 47
Sowing, 1⅚ hours, 2-horse team at 34 cents per hour..	62
Cutting, 2 hours, 4-horse team at 48 cents per hour..	96
Twine at 30 cents per acre..	70
Use of machinery, 60 cents per acre..	1 40
Stooking, 2 hours manual labour at 19 cents per hour..	38
Threshing, 24⅗ bushels at 7 cents per bushel..	1 72

Yield of grain per acre, 634 pounds; yield of straw per acre, 1,603 pounds.
Total cost of produce (24⅗ bushels grain), (3,740 pounds straw), $16.16.
Cost to produce 1 bushel of grain, 65 cents.
Cost to produce 1 ton of straw, $8.64.

COST OF PRODUCING WHEAT ON ROTATION "R."—*Concluded.*

Year 6—Wheat after Summer-fallow.

Number of acres, $2\frac{1}{3}$.	
Rent of land at $2 per acre.. .. ..$	4 67
Harrowing in spring, 1$\frac{1}{12}$ hours, 4-horse team at 48 cents per hour..	52
Seed, 4$\frac{1}{12}$ bushels at 85 cents per bushel..	3 47
Sowing, $1\frac{5}{6}$ hours, 2-horse team at 34 cents per hour..	62
Packing after seeding, 1 hour, 2-horse team at 34 cents per hour.. ..	34
Harrowing after grain was up, $\frac{7}{12}$ hour, 4-horse team at 48 cents per hour..	28
Cutting, $2\frac{1}{4}$ hours, 4-horse team at 48 cents per hour..	1 08
Twine, 30 cents per acre..	70
Use of machinery, 60 cents per acre..	1 40
Stooking, 2 hours manual labour at 19 cents per hour..	38
Threshing, $32\frac{1}{2}$ bushels at 7 cents per bushel..	2 27

Yield of grain per acre, 834 pounds; yield of straw per acre, 1,441 pounds.
Total cost of produce ($32\frac{1}{2}$ bushels grain), (3,362 pounds straw, $15.73.
Cost to produce 1 bushel of grain, 49 cents.
Cost to produce 1 ton of straw, $9.98.

COST OF PRODUCING OATS ON ROTATION "J."

For duration and nature of rotation, see cost of production of wheat in Rotation "J."

Year 4—Oats after Wheat.

Number of acres, 2.	
Rent of land at $2 per acre.. .. ..$	4 00
Ploughing in fall, $4\frac{1}{2}$ hours, 4-horse team at 48 cents per hour..	2 16
Packing after ploughing, $\frac{5}{6}$ hour, 2-horse team at 34 cents per hour..	28
Harrowing after packing, $\frac{1}{2}$ hour, 4-horse team at 48 cents per hour..	24
Harrowing in spring, $\frac{7}{12}$ hour, 4-horse team at 48 cents per hour..	28
Seed, 5 bushels at 50 cents per bushel..	2 50
Sowing, $1\frac{3}{4}$ hours, 2-horse team at 34 cents per hour..	59
Cutting, $1\frac{3}{4}$ hours, 4-horse team at 48 cents per hour..	84
Twine, at 30 cents per acre..	60
Use of machinery, at 60 cents per acre..	1 20
Stooking, $\frac{2}{3}$ hour manual labour at 19 cents per hour..	13
Threshing, 44 bushels at 4 cents per bushel..	76

Yield of grain per acre, 750 pounds; yield of straw per acre, 938 pounds.
Total cost of produce (44 bushels grain), (1,876 pounds straw), $14.58.
Cost to produce 1 bushel of grain, 33 cents.
Cost to produce 1 ton of straw, $15.54.

COST OF PRODUCING OATS ON ROTATION "R."

For duration and nature of rotation, see cost of production of wheat in Rotation "R."

Year 4—Oats on Fall Ploughing.

Number of acres, $2\frac{1}{3}$.	
Rent of land at $2 per acre.. .. ..$	4 67
Ploughing in fall, $4\frac{1}{2}$ hours, 4-horse team at 48 cents per hour..	2 16
Packing after ploughing, $1\frac{1}{4}$ hours, 2-horse team at 34 cents per hour..	42
Harrowing after ploughing, $\frac{1}{2}$ hour, 4-horse team at 48 cents per hour..	24
Discing in spring, 1 hour, 4-horse team at 48 cents per hour..	48
Harrowing in spring, $\frac{7}{12}$ hours, 4-horse team at 48 cents per hour..	27
Seed, $4\frac{2}{3}$ bushels at 50 cents per bushel..	2 33
Sowing, 2 hours, 2-horse team at 34 cents per hour..	68
Packing after seeding, 1 hour, 2-horse team at 34 cents per hour.. ..	34
Cutting, 1 hour, 4-horse team at 48 cents per hour..	48
Twine, at 30 cents per acre..	70
Use of machinery, at 60 cents per acre..	1 40
Stooking, $\frac{5}{6}$ hour manual labour at 19 cents per hour..	16
Threshing, 32 bushels at 4 cents per bushel..	1 28

Yield of grain per acre, 467 pounds; yield of straw per acre, 729 pounds.
Total cost of produce (32 bushels grain), (1,700 pounds straw), $15.61.
Cost to produce 1 bushel of grain, 49 cents.
Cost to produce 1 ton of straw, $18.38.

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COST OF PRODUCING OATS ON ROTATION "R."—*Concluded.*

Year 7—Oats on Fall Ploughing.

Number of acres, 2⅓.	
Rent of land at $2 per acre . . . . . . $	4 67
Ploughing in fall, 6⅓ hours, 4-horse team at 48 cents per hour	3 04
Packing after ploughing, 1¼ hours, 2-horse team at 34 cents per hour.	40
Harrowing after ploughing, 7/12 hour, 4-horse team at 48 cents per hour.	28
Harrowing in spring, ½ hour, 4-horse team at 48 cents per hour	24
Seed, 4⅔ bushels at 50 cents per bushel	2 33
Sowing, 2 hours, 2-horse team at 34 cents per hour	68
Packing after seeding, ⅔ hour, 2-horse team at 34 cents per hour	24
Cutting, 1¾ hours, 4-horse team at 48 cents per hour	84
Twine, at 30 cents per acre	70
Use of machinery, at 60 cents per acre	1 40
Stooking, 1 hour manual labour at 19 cents per hour	19
Threshing, 31⅔ bushels at 4 cents per bushel	1 28

Yield of grain per acre 463 pounds; yield of straw per acre, 795 pounds.
Total cost of produce (31⅔ bushels grain), (1,855 pounds straw), $16.29.
Cost to produce 1 bushel of grain, 51 cents.
Cost to produce 1 ton of straw, $17.85.

COST OF PRODUCING BARLEY ON ROTATION "P."

For duration and nature of rotation, see cost of production of wheat in Rotation "P."

Year 6—Barley after Peas.

Number of acres, 1½.	
Rent of land at $2 per acre . . . . . . $	3 00
Ploughing in fall, 3½ hours, 4-horse team at 48 cents per hour	1 68
Packing after ploughing, 1 hour, 2-horse team at 34 cents per hour . .	34
Harrowing after ploughing, ½ hour, 4-horse team at 48 cents per hour . .	24
Harrowing in the spring, 1 1/12 hours, 4-horse team at 48 cents per hour . .	52
Seed, 3 bushels at 50 cents per bushel	1 50
Sowing, 1 7/12 hours, 2-horse team at 34 cents per hour	54
Packing after seeding, 7/12 hour, 2-horse team at 34 cents per hour . .	20
Cutting, 1 7/12 hours, 4-horse team at 48 cents per hour	76
Twine, at 30 cents per acre	45
Use of machinery, at 60 cents per acre	90
Stooking, 1 hour manual labour at 19 cents per hour	19
Threshing, 11 bushels at 5 cents per bushel	55

Yield of grain per acre, 356 pounds; yield of straw per acre, 746 pounds.
Total cost of produce (11 bushels grain), (1,119 pounds straw), $10.87.
Cost to produce 1 bushel of grain, 99 cents.
Cost to produce 1 ton of straw, $19.40.

COST OF PRODUCING PEAS ON ROTATION "P."

For duration and nature of rotation, see cost of production of wheat in Rotation "P."

Year 5—Peas after Summer-fallow.

Number of acres, 1½.	
Rent of land at $2 per acre . . . . . . $	3 00
Discing in spring, 2½ hours, 4-horse team at 48 cents per hour	1 20
Harrowing in spring, ½ hour, 4-horse team at 48 cents per hour	24
Share of manure rate of 15 tons per acre, at $1 per ton	2 45
Seed, 3 bushels at $1.35 per bushel	4 05
Sowing, 1 5/12 hours, 2-horse team at 34 cents per hour	49
Packing after seeding, 7/12 hours, 2-horse team at 34 cents per hour . .	20
Cutting, 2½ hours, 2-horse team at 34 cents per hour	85
Use of machinery at 60 cents per acre	90
Manual labour, 15 hours at 19 cents per hour	2 85
Threshing, 40 bushels at 7 cents per bushel	2 80

Yield of grain per acre, 1,593 pounds; yield of straw per acre, 2,627 pounds.
Total cost of produce (40 bushels grain), (3,900 pounds straw), $19.03.
Cost to produce 1 bushel of grain, 47 cents.
Cost to produce 1 ton of straw, $9.61.

COST OF PRODUCING PEAS ON ROTATION "R."

For duration and nature of rotation, see cost of production of wheat in Rotation "R."

Year 3—Peas after Summer-fallow.

Number of acres, 2⅓.	
Rent of land at $2 per acre	$4 67
Discing in spring, 2 hours, 4-horse team at 48 cents per hour	96
Share of manure at rate of 7½ tons per acre at $1 per ton	1 12
Seed, 4⅔ bushels at $1.35 per bushel	6 30
Sowing, 2 hours, 2-horse team at 34 cents per hour	68
Cutting, 10 hours, 2-horse team at 34 cents per hour	3 40
Use of machinery, at 60 cents per acre	1 40
Manual labour, 30 hours at 19 cents per hour	5 70
Threshing, 47⅝ bushels at 7 cents per bushel	3 30
Yield of grain per acre, 1,210 pounds; yield of straw per acre, 2,835 pounds.	
Total cost of produce (47⅝ bushels grain), (6,615 pounds straw)	27 53
Cost of produce 1 bushel of grain	58
" " 1 ton of straw	8 32

SUMMARY Cost of Production of Field Crops, 1914.

Crop.	Area.	Yield per acre		Cost to produce		
				Per acre	Per ton.	Per bush.
	Acres.	Bush.	Lb.	$ c.	$ c.	cents.
Wheat	15·94	12	53	7 31	....	73·55
Oats	6·66	15	26	6 98	....	43·66
Barley	1·5	7	2	7 24	....	97·00
Peas	3·83	23	30	11 78	....	51·00
Hay	6·03	..	..	5 81	8 71	....

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ROTATION OF CROPS.

Some very interesting data have accumulated during the past few years in connection with the crop rotation experiments conducted on the Station. The rotations under way are, for the most part, very simple, and do not, as yet, include hoed crops of any kind. Each rotation has one summer-fallow field to conserve the moisture for succeeding crops, and to aid in the destruction of weeds. Grasses and clovers are used in three rotations, and in addition to the cereal crops commonly grown, peas have been used in two of the rotations. They have proven to be an extremely profitable crop.

PLOT A.—CONTINUOUS WHEAT.

One acre has been devoted to growing a crop of wheat every year. This is called "plot A." During the past season the drought affected this lot more than any other on the Station. The returns from this experiment indicate the necessity of summer-fallowing at frequent intervals, in order to maintain sufficient moisture in the soil for successful crop production.

ROTATION "C" (THREE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

This is the rotation that is commonly practised in the grain-growing sections of the west. With proper management, this arrangement of crops usually produces fairly satisfactory yields, for a number of years, on the new and fertile soils. However, the increasingly rapid spread of weeds will necessitate more frequent soil tillage, and with the increase in the tillage there wi'l be a serious destruction of humus and soil fibre. Eventually, therefore, some system of rotations must be adopted, whereby humus and fibre can be returned to the soil.

ROTATION "J" (SIX YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Oats, seeded down with western rye grass, 10 pounds; red clover, 3 pounds; and alfalfa, 3 pounds per acre.

Fifth year.—Hay.

Sixth year.—Pasture.

Rotation "J" has proven, during the past three years, to be one of the most profitable rotations under test, the average profit per acre being \$6.12, whereas on the straight grain growing rotation "C" the average profit only amounted to \$3.03 per acre.

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Rotation "J" might be described as the first step in the direction of a permanent system of crop rotation. It incorporates the two classes of crop, i.e., grasses and clovers, and cereals that are used in rotations in general farm practice, but does not include a hoed crop of any kind. It provides for one-third of the area to be in grass, one-third to be used for wheat production, one-sixth for the production of seed grain, and one-sixth to be summer-fallowed. The different crops are well balanced, and allow for the sale of some wheat, as well as for feeding a considerable number of live stock. Sufficient grass-roots should be available for furnishing soil fibre, and the two years that the fields are down to grass, should aid materially in the control of weeds.

ROTATION "P" (EIGHT YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Summer-fallow.

Fifth year.—Peas, manure, 15 tons per acre.

Sixth year.—Barley seeded down with rye grass, red clover and alfalfa.

Seventh year.—Hay.

Eighth year.—Pasture.

This rotation is a typical mixed-farming rotation, and is intended for a farm where a considerable number of live stock are fed highly concentrated feeds, as one-quarter of the rotation produces grain for feed purposes. The two summer-fallows, in the eight years, should supply ample moisture for the succeeding crops. The two years that the land is sown to grass should maintain sufficient fibre in the soil, and the application of 15 tons of barnyard manure, once in eight years, should return considerable plant food to the soil, as well as improve its mechanical condition.

ROTATION "R" (NINE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Peas. Manure 15 tons per acre.

Third year.—Wheat.

Fourth year.—Oats.

Fifth year.—Summer-fallow.

Sixth year.—Wheat.

Seventh year.—Oats, seeded down with rye grass, red clover and alfalfa.

Eighth year.—Hay.

Ninth year.—Pasture.

This is also a mixed-farming rotation, and pre-supposes a considerable number of live stock on the farm. It allows for a reasonable amount of summer-fallow, and a

fairly good acreage sown to grass. However, only two-ninths of the farm will be producing wheat, the crop which is now the main stay of the western farmers. One-third of the farm is used for the production of grain for feeding live stock. It is thus quite apparent that in a system such as this, the profits must be realized, for the most part, from marketing the grain through feeding stock.

ROTATION EXPERIMENTS.

COMPARATIVE Costs, Returns, and Net Profits or Losses per acre.

Rotation.	Total cost to operate 1914.	Value of returns 1914.	Net profit 1914.	Net Profit, average 3 year.
	$ c.	$ c.	$ c.	$ c.
Plot "A" (continuous wheat)	7 90	3 70	—4 20	0 81
"C" (three years' duration)	6 53	7 64	1 11	3 03
"J" (six years' duration)	6 03	8 18	2 15	6 12
"P" (eight years' duration)	6 73	8 22	1 49	4 51
"R" (nine years' duration)	6 57	6 76	19	5 53

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ROTATION "A"

Rotation year.	Crops.		Area.	Items of Expense								
				Rent and manure.	Seed, twine and use of machinery.	Manual labour.		Horse Labour (including teamster.) Hours.				
						Hours.	Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
	1913.	1914.	Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
	Wheat.........	Wheat.........	1	2 00	2 40	1	19	.....	$2\frac{1}{3}$	.....	$4\frac{2}{3}$	.....
	Aggregate.....................		.....	2 00	2 40	1	19	.....	$2\frac{1}{3}$	.....	$4\frac{2}{3}$	.....
	Average per acre..........		.....	2 00	2 40	1	19	.....	$2\frac{1}{3}$	.....	$4\frac{2}{3}$	.....

ROTATION "C"

Rotation year	1913	1914	Area	Rent and manure	Seed, twine and use of machinery	Manual labour Hours	Manual labour Cost	Single horse	2-horse team	3-horse team	4-horse team	5-horse team
1st...	Wheat.........	Fallow.........	1·5	3 00	0 90	.....	.....	.....	$\frac{3}{4}$	.....	7	.....
2nd...	Fallow.........	Wheat.........	1·5	3 00	3 60	$\frac{5}{6}$	16	.....	$2\frac{1}{3}$	.....	$2\frac{1}{2}$	.....
3rd...	Wheat.........	Wheat.........	1·5	3 00	3 60	$\frac{5}{6}$	16	.....	$2\frac{5}{12}$	.....	$5\frac{2}{3}$	.....
	Aggregate.....................		4·5	9 00	8 10	$1\frac{2}{3}$	32	.....	$5\frac{1}{2}$	.....	$15\frac{1}{6}$	.....
	Average per acre..........		.....	2 00	1 80	$\frac{1}{3}$	07	.....	$1\frac{2}{9}$	.....	$3\frac{1}{3}$	

ROTATION "J"

Rotation year	1913	1914	Area	Rent and manure	Seed, twine and use of machinery	Manual labour Hours	Manual labour Cost	Single horse	2-horse team	3-horse team	4-horse team	5-horse team
1st...	Pasture.........	Fallow.........	2·20	4 40	1 32	.....	.....	.....	$1\frac{1}{16}$	.....	$10\frac{1}{12}$	.....
2nd...	Fallow.........	Wheat.........	2·20	4 40	5 28	1	19	.....	$2\frac{2}{3}$	.....	$4\frac{1}{3}$	.....
3rd...	Wheat.........	Wheat.........	2·20	4 40	5 28	1	19	.....	$2\frac{1}{2}$	.....	$8\frac{5}{12}$	.....
4th...	Wheat.........	Oats.........	2·00	4 00	4 18	$\frac{3}{4}$	14	.....	$2\frac{7}{12}$	.....	$7\frac{1}{3}$	.....
5th...	Oats.........	Hay.........	2·20	4 40	4 54	6	1 14	.....	$6\frac{2}{3}$	.....	.....	.....
6th...	Hay.........	Pasture.........	2·20	4 40	3 22	.....	.....	.....	.....	.....	.....	.....
	Aggregate.....................		13·00	26 00	23 82	$8\frac{3}{4}$	1 66	.....	$15\frac{7}{12}$	.....	$30\frac{1}{6}$	.....
	Average per acre..........		.....	2 00	1 83	$\frac{7}{20}$	13	.....	$1\frac{1}{5}$	.....	$2\frac{1}{3}$	

ROTATION "R"

Rotation year	1913	1914	Area	Rent and manure	Seed, twine and use of machinery	Manual labour Hours	Manual labour Cost	Single horse	2-horse team	3-horse team	4-horse team	5-horse team
1st...	Pasture.........	Fallow.........	2·33	4 67	1 40	.....	.....	.....	$1\frac{5}{12}$	.....	$13\frac{1}{6}$	.....
2nd...	Fallow.........	Peas.........	2·33	5 79	6 65	30	5 70	.....	12	.....	2	.....
3rd...	Peas.........	Wheat.........	2·33	4 67	5 60	2	38	.....	$1\frac{5}{6}$	.....	$6\frac{2}{3}$	.....
4th...	Wheat.........	Oats.........	2·33	4 67	4 43	$\frac{5}{6}$	16	.....	$4\frac{1}{4}$	.....	$7\frac{7}{12}$	.....
5th...	Oats.........	Fallow.........	2·33	4 67	1 40	.....	.....	.....	$1\frac{1}{6}$	.....	$11\frac{1}{2}$	.....
6th...	Fallow.........	Wheat.........	2·33	4 67	5 60	2	38	.....	$2\frac{5}{6}$	.....	$3\frac{11}{12}$	.....
7th...	Wheat.........	Oats.........	2·33	4 67	4 43	1	19	.....	4	.....	$9\frac{1}{6}$	.....
8th...	Oats.........	Hay.........	2·33	4 67	4 81	$6\frac{2}{3}$	1 27	.....	7	.....	.....	.....
9th...	Hay.........	Pasture.........	2·33	4 67	4 81	.....	.....	.....	.....	.....	.....	.....
	Aggregate.....................		20·97	43·15	39 13	$42\frac{1}{2}$	8 08	.....	$34\frac{1}{2}$	.....	54	.....
	Average per acre..........		.....	2 05	1 86	2	0 38	.....	$1\frac{2}{3}$		$2\frac{7}{12}$	

ROTATION "P"

Rotation year	1913	1914	Area	Rent and manure	Seed, twine and use of machinery	Manual labour Hours	Manual labour Cost	Single horse	2-horse team	3-horse team	4-horse team	5-horse team
1st...	Peas and oats..	Fallow.........	1·5	3 00	0 90	.....	.....	.....	$\frac{3}{4}$		$6\frac{7}{12}$	.....
2nd...	Fallow.........	Wheat.........	1·5	3 00	3 60	1	19	.....	$1\frac{1}{6}$	.....	$2\frac{1}{4}$	.....
3rd...	Wheat.........	Wheat.........	1·31	2 75	3 30	1	19	.....	$2\frac{1}{4}$	.....	$6\frac{1}{6}$	.....
4th...	Wheat.........	Fallow.........	1·5	3 00	0 90	.....	.....	.....	1	.....	$7\frac{5}{12}$	.....
5th...	Fallow.........	Peas.........	1·5	5 45	4 27	15	2 85	.....	$4\frac{1}{2}$	.....	3	.....
6th...	Peas.........	Barley.........	1·5	3 00	2 85	1	1[illegible]	.....	[illegible]	.....	$6\frac{2}{3}$	.....
7th...	Barley.........	Hay.........	1·5	3 00	3 0[illegible]	$5\frac{1}{2}$	1 0[illegible]	.....	$6\frac{1}{3}$	.....	.....	.....
8th...	Hay.........	Pasture.........	1·5	3 00	2 19	.....	.....	.....	.....	.....	.....	.....
	Aggregate.....................		11·81	26 20	21 10	$23\frac{1}{2}$	4 46		$19\frac{1}{6}$		$32\frac{1}{12}$	.....
	Average per acre..........		.....	2 20	1 79	2	0 37		$1\frac{3}{5}$	.....	3	.....

SCOTT.

(wheat continuously.)

in raising Crop.							Particulars of Crop.						
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
3 03	0 28	7 90	7 90				231	1,239			3 70	3 70	—4 20
3 03	0 28	7 90											
3 03	0 28		7 90									3 70	—4 20
(Three year's duration).													
3 61		7 51	5 01										—5 01
1 99	1 68	10 43	6 95	43			1,450	1,906			20 28	13 52	6 57
3 54	1 15	11 45	7 63	68			1,004	1,426			14 11	9 40	1 77
9 14	2 83	29 39									34 39		
2 03	0 63		6 53									7 61	1 11
(Six years' duration).													
5 24		10 96	4 98										-4 98
2 99	3 60	16 46	7 48	32		6	3,098	2,938			42 76	19 43	11 95
4 89	1 75	16 51	7 50	66		6	1,500	1,710			20 85	9 48	1 98
4 34	1 76	14 42	7 21	32		6	1,500	1,876			16 87	8 43	1 22
2 27		12 35	5 61		7 25				3,404		17 02	7 73	2 12
		7 62	3 48								8 80	4 00	0 52
19 73	7 11	78 32									106 30		
1 52	0 55		6 03									8 18	2 15
(Nine years' duration).													
6 80		12 87	5 51										-5 51
5 04	3 29	26 47	11 34	56		3	2,825	6,615			48 98	20 99	9 65
3 82	1 72	16 19	6 94	66		6	1,480	3,740			21 60	9 25	2 31
5 22	1 28	15 76	6 75	49		5	1,088	1,698			12 57	5 39	1 36
5 92		11 99	5 14										-5 14
2 84	2 27	15 76	6 75	48		6	1,947	3,365			27 64	11 85	5 16
5 76	1 28	16 33	6 99	50		6	1,080	1,855			12 65	5 42	1 57
2 38		13 13	5 63		11 51				2,280		11 40	4 89	0 74
		9 48	4 06								7 00	3 00	-1 06
37 78	9 84	137 98									141 84		
1 81	0 47		6 57									6 76	0 19
(Eight years' duration).													
3 41		7 31	4 87										4 87
1 48	2 04	10 31	6 87	35		6	1,750	2,910			24 78	16 52	9 65
3 82	0 80	10 86	7 90	99		6	685	1,035			9 65	7 01	0 89
3 90		7 80	5 20										5 20
2 97	2 80	18 34	12 23	46			2,390	3,941			39 79	26 52	14 29
4 28	0 55	10 87	7 24	97		6	534	1,120			6 46	4 31	—2 93
2 17		9 30	6 20		7·38				2,520		12 60	8 40	2 20
		5 19	3 46								4 50	3 00	—0 46
22 03	6 19	79 98									97 78		
1 85	0 52		6 73									8 22	1 49

SCOTT.

OTHER CROP MANAGEMENT, EXPERIMENTS.

RATES OF SEEDING.

Rates of Seeding Wheat on Summer-fallow.

Variety.	Quantity of seed per acre.	Number of days maturing.	Yield per acre, 1914.		Average yield, 3 years.	
	Bush.		Bush.	Lb.	Bush.	Lb.
Marquis	$\frac{3}{4}$	116	20	00	21	20
"	$1\frac{1}{4}$	116	18	40	22	30
"	$1\frac{3}{4}$	115	18	40	26	30
"	$2\frac{1}{4}$	115	18	00	25	00
"	$2\frac{3}{4}$	115	14	40	22	00
Prelude	$\frac{3}{4}$	108	11	00	....	....
"	$1\frac{1}{4}$	108	10	50	......	......
"	$1\frac{3}{4}$	105	11	20	......	......
"	$2\frac{1}{4}$	104	13	50	......	......
"	$2\frac{3}{4}$	104	10	30	......	......

The land was well summer-fallowed in 1913. The wheat was sown on April 17, 1914.

Rates of Seeding Oats on Summer-fallow.

Variety.	Quantity of seed per acre.	Number of days maturing.	Yield per acre, 1914.		Average yield, 3 years.	
	Bush.		Bush.	Lb.	Bush.	Lb.
Banner	1	99	48	8	94	4
"	$1\frac{1}{2}$	99	52	32	88	27
"	2	99	41	26	86	16
"	$2\frac{1}{2}$	97	57	22	79	00
"	3	92	61	6	79	7
"	$3\frac{1}{2}$	94	61	6	75	27

The oats were sown on May 8, on well worked summer-fallow land.

Rates of Seeding Barley on Summer-fallow.

Plot.	Variety.	Quantity of seed per acre.	Number of days maturing.	Yield per acre, 1914.		Average yield 3 years.	
		Bush.		Bush.	Lb.	Bush.	Lb.
1.	Manchurian	1	106	14	8	43	43
2.	"	$1\frac{1}{2}$	104	12	24	41	25
3.	"	2	104	13	16	36	18
4.	"	$2\frac{1}{2}$	104	13	36	35	46
5.	"	3	104	13	16	35	40

The barley was sown on well-worked summer-fallow on May 1, at the above rates of seed per acre.

Scott.

DATES OF SEEDING.

DATES of Seeding Marquis Wheat on Summer-fallow.

Dates of Seeding.	Number of days maturing.	Yield per acre, 1914.	
		Bush.	Lb.
April 17	115	18	40
" 24	116	18	20
May 1	118	19	20
" 8	123	21	20
" 15	123	18	00

The Marquis wheat was sown at the rate of 1¾ bushels per acre on well worked summer-fallow.

DATES of Seeding Banner Oats Sown on Summer-fallow.

Dates of Seeding.	Number of days maturing.	Yield per acre, 1914.	
		Bush.	Lb.
April 17	111	67	2
" 24	108	62	12
May 1	102	67	2
" 8	97	60	00
" 15	90	55	10

The Banner oats were sown at the rate of 2¼ bushels per acre on summer-fallowed land.

DATES of Seeding Manchurian Barley on Summer-fallow.

Dates of Seeding.	Number of days. maturing.	Yield per acre, 1914.	
		Bush.	Lb.
April 17	111	15	00
" 24	106	15	20
May 1	99	15	00
" 8	106	13	16
" 15	104	17	4

Manchurian barley was sown at the rate of 2 bushels per acre on summer-fallow land.

SCOTT.

DATES of Seeding Common Flax on Summer-fallow.

Dates of Seeding.	Number of Days maturing.	Yield per acre, 1914.	
		Bush.	Lb.
May 1	125	6	4
" 15	109	6	24
" 29	97	6	24
*June 5	90	3	32

* Badly frosted.

Common flax was sown at the rate of 30 pounds per acre on summer-fallowed land.

SOIL MANAGEMENT EXPERIMENTS.

Seven additional experiments in soil management have been added, during the past season to the list of those already under operation on this Station. The list includes the following:—

(1) Depth of ploughing.
(2) Treatment of summer-fallow.
(3) Treatment of stubble.
(4) Breaking up cultivated grasses and clovers.
(5) Application of barnyard manure, for wheat, oats, barley, and roots.
(6) Ploughing down green manures.
(7) Treatment of seed-bed.

Four experiments have been under way two or more years. They are as follows:—

(1) Breaking prairie sod.
(2) Seeding down to grasses and clovers.
(3) Use of soil packers.
(4) Depths of seeding.

The results of these experiments are appended herewith.

SCOTT.

PRAIRIE BREAKING.

An experiment to determine the best method of breaking up the prairie sod has been under way on the Station for the past two years. The following table outlines the methods adopted, and resultant crops:—

BREAKING Prairie Sod.

Plot.	Treatment given, 1913.	Treatment given, 1914.	Yield per acre, 1913.	Yield per acre, 1914.
			Lb.	Lb.
1.	Broken 3½ inches early May. Packed, disced, harrowed. Sown to peas and oats.	Ploughed autumn, 1913. Harrowed, autumn, 1913. Harrowed and packed in spring, 1914.	1,200 (green-feed)	420 (wheat)
2.	Broken 3½ inches early May. Packed, disced, harrowed. Sown to flax.	Ploughed autumn, 1913. Harrowed, autumn, 1913. Harrowed and packed in spring, 1914.	580 (flax)	520 (wheat)
3.	Broken 4½ inches early June. Cultivated thoroughly.	Harrowed and packed in spring, 1914.	....	960 (wheat)
4.	Broken 2½ inches early June. Backset, September. Cultivated from day broken.	Harrowed and packed in spring, 1914.	....	560 (wheat)

SEEDING TO GRASSES AND CLOVERS.

Eleven plots were sown with a mixture of 10 pounds of western rye grass and 10 pounds of red clover in the spring of 1913. The following table outlines the previous treatment given the plots, as well as the method of seeding down, and the resultant crops:—

SEEDING Grasses and Clovers.

Plot.	Treatment, 1912.	Treatment, 1913.	Yield of Hay per acre, 1914.
			Lb.
1.	Summer-fallow	Seeded with wheat	1,360
2.	Summer-fallow	Seeded alone	3,000
3.	Hoed crop	Seeded with wheat	1,800
4.	Hoed crop	Seeded alone	1,600
5.	Wheat	Seeded with wheat on stubble	1,080
6.	Wheat	Seeded alone on stubble	2,520
7.	Wheat	Seeded with oats on stubble	1,440
8.	Wheat	Seeded alone	1,400
9.	Wheat	Seeded with wheat	1,600
10.	Oats	Seeded alone	2,600
11.	Wheat	Seeded with wheat	1,400

SCOTT.

PACKING FOR WHEAT SOWN ON SPRING-PLOUGHED STUBBLE LAND.

The plots, on which this part of the experiment was conducted, were in wheat the previous year. They were ploughed 6 inches deep on May 4. The harrowing, packing and sowing were all done on May 5.

Soil Packing for Wheat Sown on Spring-ploughed Stubble Land.

Plot.	Cultural treatment given.	Yield of wheat per acre, 1914. Grain.	Yield of wheat per acre, 1914. Straw.
		Lb.	Lb.
1.	Harrow, subsurface pack, harrow, seed	860	1,380
2.	Harrow, surface pack, harrow, seed	1,100	1,220
3.	Harrow, combination pack, harrow, seed	940	1,060
4.	Harrow, subsurface pack, harrow, seed, subsurface pack	1,260	1,420
5.	Harrow, surface pack, harrow, seed, surface pack	1,300	1,460
6.	Harrow, combination pack, harrow, seed, combination pack	1,340	1,380
7.	Harrow, seed, harrow	880	1,120
8.	Harrow, seed, surface pack	1,080	1,120
9.	Harrow, seed, subsurface pack	920	1,020
10.	Harrow, seed, combination pack	960	1,060
11.	Harrow, seed	980	1,300

PACKING FOR WHEAT SOWN ON FALL-PLOUGHED STUBBLE LAND.

The plots, on which this part of the experiment was conducted, were in wheat the previous year. They were ploughed 6 inches deep on October 8. The fall-packing was done the same day as the ploughing. The spring treatment, including sowing, was given on May 5.

Soil Packing for Wheat on Fall-ploughed Stubble Land.

Plot.	Cultural Treatment given.	Yield of wheat per acre, 1914. Grain.	Yield of wheat per acre, 1914. Straw.
		Lb.	Lb.
12.	Harrow, seed	920	960
13.	Subsurface pack in fall, seed in spring	680	880
14.	Subsurface pack in spring, then seed	680	600
15.	Surface pack in spring, after seeding	560	560
16.	Surface pack in fall, seed in spring	700	860
17.	Surface pack in spring, then seed	760	840
18.	Surface pack in spring, after seeding	700	900
19.	Combination pack in fall, seed in spring	700	980
20.	Combination pack in spring, then seed	840	680
21.	Combination pack in spring, after seeding	660	820
22.	Harrow, seed	720	920
23.	Surface pack in fall, seed, surface pack	840	1,160
24.	Subsurface pack in fall, seed, subsurface pack	580	740
25.	Combination pack in fall, seed, combination pack	720	1,080

Scott.

PACKING FOR WHEAT SOWN ON SUMMER-FALLOW.

The plots for this experiment were all summer-fallowed early in June, 1913. Plots 15 to 20, inclusive, were packed immediately after ploughing. The spring work, including sowing, was done on May 2.

Soil Packing for Wheat on Summer-fallow.

Plot.	Cultural treatment given.		Yield of Wheat per acre, 1914. Grain.	Yield of Wheat per acre, 1914. Straw.
			Lb.	Lb.
1	Harrow, seed	Spring work when seeding.	1,200	1,920
2	Harrow, seed, surface pack		1,400	2,040
3	Harrow, seed, surface pack, harrow		1,200	2,000
4	Harrow, seed, subsurface pack		1,400	2,120
5	Harrow, seed, subsurface pack, harrow		1,320	1,840
6	Harrow, seed, combination pack		1,240	1,880
7	Harrow, seed, combination pack, harrow		1,300	1,860
8	Surface pack, seed, surface pack		1,240	1,760
9	Subsurface pack, seed, subsurface pack		1,620	1,820
10	Combination pack, seed, combination pack		1,360	1,600
11	Surface pack, harrow, seed		1,080	1,320
12	Subsurface pack, harrow, seed		1,160	1,560
13	Combination pack, harrow, seed		1,120	1,640
14	Harrow, seed		1,280	1,560
15	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed		1,480	1,720
16	Plough for summer-fallow, subsurface pack, cultivate; next spring, smoothing harrow, seed		1,560	1,880
17	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed		1,500	1,740
18	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed, surface pack		1,360	2,000
19	Plough for summer-fallow, subsurface pack, cultivate; next spring, smoothing harrow, seed, subsurface pack		1,260	1,340
20	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed, combination pack		1,520	1,960
21	Harrow, seed	Spring work when seeding.	1,680	2,000
22	Harrow, seed, harrow when 6 inches high		1,440	1,720
23	Harrow, seed, surface pack when 6 inches high		1,140	1,500
24	Harrow, seed, roll when 6 inches high		1,120	1,520
25	Harrow, seed		1,280	1,360

DEPTHS OF SEEDING.

DEPTHS OF SEEDING WHEAT ON SUMMER-FALLOW.

Four plots of wheat were sown on May 2, at the rate of $1\frac{3}{4}$ bushels per acre, at depths ranging from 1 to 4 inches. The average results for the past three years from this experiment are also included in the following table:—

Plot.	Depth of seeding.	Number of days maturing.	Yield per acre, 1914. Grain.	Yield per acre, 1914. Straw.	Average yield per acre, 3 years. Grain.
			Lb.	Lb.	Lb.
1	1 inch deep	117	1,200	1,400	1,780
2	2 inches deep	117	1,280	1,920	1,813
3	3 inches deep	117	1,640	2,440	1,993
4	4 inches deep	117	1,880	2,720	1,993

Scott.

DEPTH OF SEEDING OATS ON FALL-PLOUGHED LAND.

Four plots of oats were sown on May 2, at the rate of 2¼ bushels per acre, at depths ranging from 1 to 4 inches. The following table also includes the average results for the past three years:—

Depths of Seeding Oats.

Plot.	Depth of seeding.	Number of days maturing.	Yield per acre, 1914. grain.	Yield per acre, 1914. straw.	Average yield per acre, 3 years. grain.
			Lb.	Lb.	Lb.
1	1 inch deep	105	680	1,520	1,813
2	2 inches deep	105	700	1,580	2,180
3	3 inches deep	105	600	1,680	2,206
4	4 inches deep	105	520	1,680	2,013

EXPERIMENTAL STATION FOR SOUTHERN ALBERTA, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

SEASONAL NOTES.

On account of the excessive drought the season of 1914 has been, with the possible exception of 1910, when the area affected was more restricted, the most trying that has been experienced in southern Alberta since settlement has taken place. In regard to the amount of moisture carried in the soil from 1913 it might be said that the precipitation during the last four months of that year was light, amounting in all to only 2½ inches. During this period, heavy drying winds were prevalent with little or no snow on the ground, so that the soil moisture was severely drawn upon. To counteract this in a measure, however, 3·63 inches of precipitation were received during the first three months of this year, so that the soil was reasonably moist and in excellent condition when work on the land was started.

The first discing, harrowing, or seeding on the Station occurred March 17. The ground froze up toward the latter part of March but opened again shortly, and seeding became general from April 4. Unfortunately, the rainfall during April, May, and until the latter part of June was very much less than usual. For this entire period no soaking rain was experienced, what did come was in the form of light showers that were not sufficient to wet through the dry layer of 2 or 3 inches at the surface and connect with the moisture lower down. The fact that the total precipitation for April was only 0·5 of an inch, and for May 0·3 of an inch, fully illustrates how serious conditions were and how difficult it was to obtain a stand from seeds when sown. A wet spell during the last ten days of June revived things generally, but the dry hot July was too severe a strain on plant life, and the result was that there was a failure of all crops except those sown on summer-fallow. Corn, and late-sown roots which were benefited by the August rains were a possible exception, although they, of course, did much better on summer-fallow. The last frost in the spring occurred on May 12 when a temperature of 29·8 was recorded. The first frost in the fall was on September 15, when the temperature dropped to 31·0°. After passing through such a trying season as this past has been, many settlers, more particularly those who have been located only for the past few years, are anxious to obtain information in regard to the rainfall in the past. Many letters of inquiry in this connection have been received at the Station, and on this account, there is given in the table following the rainfall by months since January, 1902. From February, 1908, the rainfall given is from the records made at the Experimental Station, while the precipitations previous to that date are taken from the records made by Mr. C. B. Bowman, in the city of Lethbridge. A study of the monthly rainfall during the past thirteen years indicates that the precipitation is received in an irregular manner and that there is a great difference between the year that received the lightest rainfall and the year that received the heaviest.

Some Weather Observations taken at Lethbridge Experimental Station, 1914.

Month.	Temperature F. Mean.	Temperature F. Highest.	Temperature F. Lowest.	Total Precipitation.	Total Sunshine.
	°	°	°	Inches.	Hours.
January	17·05	55·1	−27·0	1·55	104·1
February	11·05	48·1	−40·0	0·96	120·4
March	29·42	64·0	−15·9	1·12	207·4
April	42·4	68·1	16·0	0·54	195·2
May	51·25	79·0	21·2	0·29	318·9
June	58·4	92·0	34·1	2·48	280·5
July	67·5	94·2	40·0	0·93	386·2
August	62·08	97·2	35·4	3·59	295·0
September	52·8	86·0	31·0	1·07	221·4
October	42·88	85·5	20·1	2·17	137·6
November	35·7	66·0	− 8·0	0·63	89·8
December	9·46	42·0	−23·5	1·19	115·0
Total for year				16·52	2,471·5

Lethbridge.

Record of Precipitation at Lethbridge from January, 1902-14.

Month.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911	1912.	1913.	1914.	Average for 13 years.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
January...	0·67	0·62	0·50	1·45	0·22	1·52	0·27	0·49	0·24	0·70	0·80	0·69	1·55	0·75
February..	1·03	0·79	0·90	0·05	0·20	0·30	0·75	0·28	0·83	0·52	0·40	0·30	0·96	0·55
March.....	0·48	0·89	1·03	0·74	0·54	0·34	1·10	0·37	0·17	0·32	0·44	0·42	1·12	0·61
April......	0·15	0·33	0·41	0·56	1·30	1·08	0·67	1·51	0·28	0·82	0·20	0·52	0·54	0·64
May......	11·27	2·95	2·86	1·13	8·60	1·14	2·78	4·27	0·79	1·90	0·66	1·70	0·29	3·10
June.......	5·68	1·12	1·80	2·68	2·31	3·64	7·64	0·62	0·53	4·71	1·73	4·70	2·48	3·05
July.......	5·95	1·86	0·96	1·44	0·83	1·43	0·41	1·98	0·09	2·27	2·78	1·29	0·93	1·71
August....	0·69	3·21	1·19	1·99	4·70	2·30	0·89	0·21	1·07	3·63	1·41	1·93	3·59	2·06
September	0·84	1·60	0·52	0·80	0·16	3·24	0·73	0·49	2·01	4·16	2·61	1·65	1·07	1·53
October...	0·02	0·18	0·85	1·13	1·93	0·05	1·16	0·40	0·59	0·57	1·07	0·50	2·17	0·80
Nov'mber	0·43	0·58	0·03	1·36	0·81	0·14	0·02	0·53	0·41	0·95	0·99	0·36	0·63	0·56
December	0·84	0·70	0·35	0·25	0·88	0·32	0·35	0·54	0·94	0·77	0·23	0·00	1·19	0·57
Total for year.....	28·05	14·83	11·40	13·58	22·48	15·50	16·67	11·65	7·95	21·32	13·21	14·17	16·52	15·93

IMPORTANCE OF SUMMER-FALLOW IN SOUTHERN ALBERTA.

The great variation in the amount of our rainfall from year to year, and the fact that there have been so many seasons when the precipitation, during the months of May, June, and July, has been scant, demonstrate pretty clearly the necessity of giving careful consideration to the summer-fallow. The object of the summer-fallow in southern Alberta, as has often been pointed out, is to conserve moisture. When properly carried out it helps keep weeds under control, and stimulates the growth of crops by making available plant food, but these points are secondary in importance to the fact that it is possible to store a good portion of the moisture that falls during the summer in the subsoil, and have it on hand to supplement the rainfall that comes the following season when the crop is growing. It has been shown that the wheat plant will send fibrous roots down to a depth of 3½ feet for moisture. New comers are sometimes slow in appreciating the importance, in fact the imperative need of the summer-fallow in any rotation of field crops that may be attempted here on non-irrigated land. The discouraging season we have just passed through accomplishes one thing at least, in that it demonstrates in a most striking manner the possibility of getting some crop on well summer-fallowed land in a year so dry that fall- or spring-ploughed stubble land will produce nothing. The key, therefore, to successful dry land farming is the summer-fallow; deep ploughing or the use of the subsurface packer or the disc, etc., are important details but are secondary in importance. The main thing to be borne in mind is that the land must be ploughed before the weeds and grass make any growth, and sufficient cultivation must follow to prevent all growth of vegetation of no matter what character; for the loss of moisture from the soil by evaporation is trivial compared to what is pumped out by plant growth. The cultivation that is necessary to kill the weeds forms a mulch that prevents evaporation very materially. Where the land is thus kept clean of any growth during the whole season, all the rain that arrives is taken up by the soil, and this becomes thoroughly moistened to a depth of from 5 to 7 feet.

TWO FARMS.

Of the 400 acres on the Station, one-half can now be irrigated; the balance is devoted to dry or non-irrigated farming. Two Experimental Farms are really being operated at Lethbridge. Their object is, not to compare the relative merits of the two systems, but to study their individual problems. To aid in doing this, and to prevent confusion, the report is divided into two parts. Part I deals with the results from the non-irrigated or "dry" farm, and part II with the results from the irrigated farm. In this connection, it might be well to point out that the yields of even the same variety of crop grown on the two farms in any one season are not necessarily comparable, and that an increased yield on the irrigated portion may not be entirely due to irrigation, owing to the fact that the preparation of the land in the two fields may not have been identical. Although many of the tests carried out are the same on both the dry and the irrigated farms, still it would be well for the reader, if he wishes to get a comprehensive grasp of the work, to read both parts.

PART I.—THE NON-IRRIGATED OR "DRY FARM."

CROP ROTATIONS (NON-IRRIGATED).

This is the fourth season for the following rotations:—

ROTATION "A."

Wheat continuously.

ROTATION "B" (TWO YEARS' DURATION).

First year.—Wheat.
Second year.—Summer-fallow.

ROTATION "C" (THREE YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat, or coarse grain.

ROTATION "M" (SIX YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Coarse grain. Manured in fall.
Fourth year.—Summer-fallow.
Fifth year.—Peas and oats for hay.
Sixth year.—Barley or oats.

ROTATION "S" (NINE YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Hoed crop.
Third year.—Wheat.
Fourth year.—Summer-fallow.
Fifth year.—Wheat.
Sixth year.—Coarse grain.
Seventh year.—Summer-fallow. Manured.
Eighth year.—Peas and oats for hay. Seeded in fall to rye.
Ninth year.—Rye pasture.

ROTATION "T" (TEN YEARS' DURATION).

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Oats or barley.
Fourth year.—Seeded to alfalfa in rows.
Fifth year.—Alfalfa hay or seed.
Sixth year.—Alfalfa hay or seed.
Seventh year.—Alfalfa hay, seed or pasture.
Eighth year.—Summer-fallow.
Ninth year.—Hoed crop.
Tenth year.—Wheat, manured on stubble.

So that the results from year to year may be easily compared, cost and return values have been fixed, schedule of which is included on page 245 of this report.

The following tables contain details in connection with these rotations:—

LETHBRIDGE.

ROTATION "A"

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse	2-horse team	3-horse team	4-horse team	5-horse team.
			Acres.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st...	Wheat.......	Wheat...........	1·57	3 14	3 37	0·48	0 09	......	0·81	0 99	5·65	......
	Aggregate..................		......	......	......	......	......	......	......	......	......	......
	Average per acre............		......	......	......	......	......	......	......	......	......	......

ROTATION "B"

Rotation Year.	1913.	1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost.	Single horse	2-horse team	3-horse team	4-horse team	5-horse team.
1st...	Fallow.........	Wheat.........	1·57	3 14	3 63	4·99	0·96	......	......	1·25	0·75	......
2nd...	Wheat.........	Fallow.........	1·57	3 14	0 94	0·75	1 41	0·42	1·00	......	9·70	......
	Aggregate.....		3·14	6 28	4 57	5·74	2 37	0·42	1·00	1·25	10·45	......
	Average per acre............		......	2 00	1 46	1·83	0 35	0·14	0·32	0·40	3·33	......

ROTATION "C"

Rotation Year.	1913.	1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost.	Single horse	2-horse team	3-horse team	4-horse team	5-horse team.
1st...	Oats...........	Fallow.........	1·57	3 14	1 00	0·75	1 41	0·42	1·00	......	9·60	......
2nd...	Fallow.........	Wheat.........	1·57	3 14	3 56	1·25	0 23	......	......	1·00	0·75	......
3rd...	Wheat.........	Oats...........	1·57	3 14	2 78	0·83	0 15	......	......	1·00	5·65	......
	Aggregate....................		4·71	9 42	7 34	2·83	1 79	0·42	1·00	2·00	16·00	......
	Average per acre............		......	2 00	1 55	0·60	0 38	0·09	0·21	0·42	3·4	......

ROTATION "M"

Rotation Year.	1913.	1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost.	Single horse	2-horse team	3-horse team	4-horse team	5-horse team.
1st...	Oats...........	Fallow...	1·25	5 00	0 75	0·66	0 12	......	......	......	9·12	....
2nd...	Fallow..	Peas and Oats.	1·25	5 00	2 54	2·41	0 4[illegible]	0·5	1·41	......	0·92	....
3rd...	Peas and Oats.	Oats	1·25	5 00	2 05	0 75	0 14	....	....	0·92	5·01	..
4th...	Oats...........	Fallow.........	1·25	5 00	0 75		....	....	......	......	6·17	....
5th...	Fallow.........	Wheat.........	1·25	5 00	3 02	0·75	0 14	....	....	0·92	0·66	....
6th...	Wheat.	Oats...........	1·25	5 00	2 14	3·25	0 61	0·41	0·5	0·92	4·93	....
	Aggregate.....		7·50	30 00	11 25	7·77	1 47	0·91	1·91	2·76	26·81	....
	Average per acre............		....	4 00	1 50	1·4	0 19	0·12	0·26	0·37	3·58	....

LETHBRIDGE.

(Wheat continuously).

in raising Crop.							Particulars of Crop.						
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
3 41	0 30	10 31	6 57			....	260	390	......	......	3 65	2 33	−4 24
......	...						......	......	....	......	......		...
......								...	...	....	....		......

(Two years' duration).

0 86	1 77	10 36	6 60	...	....	....	1,515	2,053	....	....	21 22	13 52	6 92
5 01	....	10 50	6 69							....	....		−6 69
5 87	1 77	20 86									21 22		....
1 87	0 57	...	6 64									6 67	0 12

(Three years' duration).

5 07	....	10 62	6 77				.....	......	.....	......		.....	−6 77
0 77	1 76	9 46	6 03	0 38	...	5·5	1,510	1,899		......	21 08	13 43	7 40
2 32	1 07	9 46	6 03				884	695	......	....	9 52	6 07	0 04
8 16	2 83	29 54	...	...	....						30 60		
1 73	0 60		6 28								.....	6 50	0 22

(Six years' duration).

4 39		10 26	8 21	....		..	....	...	....	...			−8 21
1 04		9 04	7 23		5 15	2			3,120		15 60	12 48	5 25
2 84	0 40	10 43	8 34	0 95	....	4·5	327	272	...		3 54	2 83	−5 51
2 96		8 71	6 97		.....			.....					−6 97
0 70	1 14	10 00	8 00	0 57		3·5	935	1,465			13 19	10 55	2 55
3 02	0 70	11 47	9 18	0 62	....	4·5	579	500			6 30	5 04	−4 14
14 95	2 24	59 91									38 63		...
1 99	30		7 99				....					5 15	−2 84

LETHBRIDGE.

ROTATION "S"

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
			Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
2nd...	Fallow..........	Corn..........	1·25	4 16	3 85	63·66	12 10	5·46	......	......	3·28	....
3rd...	Corn..........	Wheat..........	1·25	4 16	2 96	1·15	0 22	......	1·0	......	0·75	....
4th...	Wheat..........	Fallow..........	1·25	4 16	0 75	......	......	......	......	......	6·10	....
5th...	Fallow..........	Wheat..........	1·25	4 16	3 02	0·84	0 16	......	......	1·0	0·60	....
6th...	Wheat..........	Oats..........	1·25	4 16	2 20	0·75	0 14	......	......	0·93	5·57	....
7th...	Oats..........	Fallow..........	1·25	4 16	0 75	......	......	......	......	......	7·72	....
8th...	Fallow..........	Oats and Peas.	1·25	4 16	3 74	2·83	0 54	0·42	2·66	......	1·0	....
9th...	Oats and Peas.	Rye Pasture...	1·25	4 16	2 00	2·00	0 37	0·50	3·08	......	4·57	....
1st...	Rye Pasture...	Fallow..........	1·25	4 16	0 75	1·00	0 19	......	......	......	9·73	....
	Aggregate..........		11·25	37 44	20 02	72·24	13 72	6·38	6·74	1·93	39·38	...
	Average per acre..........		......	3 33	1 78	6·40	1 22	0·56	0·60	0·17	3·50	

ROTATION "T"

Rotation Year.	Crops. 1913.	Crops. 1914.	Area.	Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
7th...	Alfalfa Seed...	Alfalfa Seed....	1·57	5 02	1 41	2·32	0 44	4·91	1·16	......	0·48	....
8th...	Alfalfa Seed....	Fallow..........	1·57	5 02	0 94	......	......	......	......	......	16·89	....
9th...	Fallow..........	Turnips..........	1·57	5 02	1 54	98·00	18 62	7·66	14·13	......	2·32	....
10th..	Turnips..........	Wheat..........	1·57	5 02	3 44	0·25	0 05	......	......	1·00	0·75	....
1st....	Wheat..........	Fallow..........	1·57	5 02	0 94	2·32	0 44	......	......	......	10·17	....
2nd...	Fallow..........	W. Wheat......	1·57	5 02	3 77	1·16	0 22	......	......	1·16	0·83	....
3rd...	W. Wheat......	Oats..........	1·57	5 02	2 65	0·66	0 13	......	......	1·00	10·08	....
4th...	Oats..........	Alfalfa Seeding	1·57	5 02	1 41	1·99	0 38	......	......	......	10·39	....
5th...	Alfalfa Seeding	Alfalfa Seed...	1·57	5 02	1 41	2·17	0 41	6·33	1·08	......	0·50	....
6th...	Alfalfa Seed....	Alfalfa Seed....	1·57	5 02	1 41	2·50	0 47	8·09	1·26	......	1·49	....
	Aggregate..........		15·70	50 20	18 92	111·37	21 16	26·99	17·63	3·16	53·72	...
	Average per acre..........		......	3 20	1 21	7·09	1 35	1·72	1·12	0·20	3·42	

(Nine years' duration).

in raising Crop.							Particulars of Crop.						
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost of 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
3 05		23 16	18 53		1 50					30,815	46 22	36 98	18 45
0 70	1 93	9 97	7 98	0 36		4	1,665	1,795			23 09	18 47	10 49
2 93		7 84	6 27										−6 27
0 73	1 40	9 47	7 58	0 47		4	1,185	1,845			16 71	13 37	5 79
3 05	0 90	10 45	8 36	0 47		4	757	632			8 20	6 57	−1 80
3 71		8 62	6 90										−6 90
1 50		9 94	7 95		6 55	2½			3,035		15 18	12 14	4 19
3 39		9 92	7 94								2 16	1 73	−6 21
4 66		9 76	7 81										−7 81
23 72	4 23	99 13									111 56		
2 11	0 38		8 82									9 92	1 10

(Ten years' duration).

1 96	0 71	9 54	6 08	13 74			41				20 96	13 35	7 27
8 07		14 03	8 94										−8 94
7 99		33 17	21 13	0 08						26,046	39 07	24 89	3 76
0 77	1 10	10 38	6 61	0 62		3·5	100	314			1 49	0 95	−5 66
4 89		11 29	7 19										−7 19
0 88	1 54	11 43	7 28	0 52		5·	1,325	2,055			18 68	11 90	4 62
5 25	0 50	13 55	8 63	1 12		4·5	409	460			4 55	2 90	−5 73
4 95		11 76	7 49										−7 49
2 32	1 34	10 50	6 69	5 02			126				62 80	40 00	33 31
3 34	1 33	11 57	7 37	5 53			126				62 80	40 00	32 63
40 42	6 52	137 22									210 35		
2 57	0 41		8 74									13 39	4 65

Lethbridge.

In the following table the items of greatest interest in connection with the foregoing rotations are given.

ROTATION EXPERIMENTS.

Cost of Operations, Value of Products and Profits.

Rotations.	Total cost per acre.	Total value per acre.	Net profit per acre, 1914.	Average net profit per acre for 3 years
	$ cts.	$ cts.	$ cts.	$ cts.
"A" (Wheat continuously)	6 57	2 33	−4 24	3 28
"B" Two years' duration	6 64	6 76	0 12	2 27
"C" Three years' duration	6 28	6 50	0 22	4 34
"M" Six years' duration	7 99	5 15	−2 84	2 41
"S" Nine years' duration	8 82	9 92	1 10	2 92
"T" Ten years' duration	8 74	13 39	4 65	12 09

DATES OF SEEDING.

In the following tables the results obtained from wheat, oats, and barley sown at different dates are of some interest. It is planned to continue these tests for a number of seasons.

Dates of seeding Marquis Wheat (non-irrigated) on Summer-fallow.

Date sown.	Date ripe.	Yield per acre.		Average yield per acre for 3 years.	
		Bush.	Lb.	Bush.	Lb.
March 7	July 26	21	30		
March 17	July 27	21	00		
April 4	July 28	26	30	27	20
April 17	July 29	20	00	25	20
April 30	August 2	20	45	27	55
May 12	August 11	21	15	27	05
May 21	August 22	21	30	28	10
June 1	September 14	Strong winds shattered the grain and the crop was cut for green feed.			
June 23	Cut for green feed				
July 2	Cut for green feed				

Lethbridge.

DATES of Seeding Banner Oats (non-irrigated) on Summer-fallow.

Date sown.	Date ripe.	Yield per acre.		Average yield per acre for 3 years.	
		Bush.	Lb.	Bush.	Lb.
March 7	July 29	49	29	.....	.....
March 21	July 28	52	32	.....	.....
April 4	July 27	40	26	64	16
April 20	July 30	58	23	71	1
April 30	July 31	56	1	71	1
May 15	August 12	53	28	76	26
June 1	Cut for green feed, September 17.				
June 15	Cut for green feed, September 26.				
July 2	Cut for green feed, September 26.				

DATES of Seeding Mensury Barley (non-irrigated) on Summer-fallow.

Date sown.	Date ripe.	Yield per acre.		Average yield per acre for 3 years.	
		Bush.	Lb.	Bush.	Lb.
March 7	July 31	19	18	.....	.....
March 21	July 30	20	15	.....	.....
April 4	July 29	20	45	27	14
April 20	July 30	33	36	30	40
April 30	July 31	28	36	33	6
May 15	August 13	27	9	30	34
June 1	September 2	26	42	33	6
June 15	Strong winds shattered the grain and the crop was cut for green feed, September 17.				
July 2	Cut for green feed September 17.				

The larger yields from the later seedings are due to the fact that for the last few seasons the rainfall during May and early June has been particularly light, and the precipitation during the latter part of the growing season has been relatively heavier, thus giving the later sown grain the advantage.

SOIL CULTURAL EXPERIMENTS.

The cultural investigation work, started in 1911, consists of thirteen lines of experiments. Some observations concerning the work and the results obtained are herewith given:—

PRAIRIE BREAKING.

Of the six methods of breaking prairie sod, early June breaking and backsetting in September gives the most favourable results.

DEPTH OF PLOUGHING.

Of a trial of ten different depths of ploughing summer-fallow to be sown to wheat, ranging from 3 inches to 8 inches, and from 5 inches to 8 inches with 4-inch subsoiling,

or in other words from 3 to 12 inches, results indicate that about 8 inches was the best suited to the drought conditions of this season. Shallower ploughing gave lighter yields, but deeper ploughing than 8 inches did not increase the yield.

SUMMER-FALLOW TREATMENT.

The results of the three years would seem to favour ploughing 8 inches deep in June, harrowing and cultivating as necessary. Wheat following a crop of rape, sown in rows for pasture on the fallow, gave no crop this dry season, and the average of the two preceding years decreased the yield of wheat as compared to summer-fallow 10½ bushels per acre.

A fallow ploughed June 15 produced an increase of 6½ bushels per acre of wheat more than a fallow ploughed July 15, but otherwise similarly treated.

Once ploughing of the fallow is preferable to twice ploughing. Ploughing 6 inches in June, showed an increase of 3 bushels 50 pounds per acre of wheat over ploughing 6 inches in June and 6 inches in September. Similarly, ploughing 6 inches in June showed an increase of 5 bushels 20 pounds per acre of wheat over ploughing 8 inches in June and 8 inches in September, otherwise same cultivation.

STUBBLE TREATMENT.

The experiment with ten methods of preparing stubble land for wheat and three for oats, showed highest yields when grain was sown on spring ploughed land. The unusually dry season appeared to particularly emphasize this fact.

SEEDING TO GRASSES AND CLOVERS.

This work consists of a test of seeding down with and without a nurse crop on land prepared in different ways. The best results were obtained on summer-fallow. Larger yields resulted when sown without a nurse crop.

BREAKING SOD FROM CULTIVATED GRASSES AND CLOVERS.

Land has been seeded with a uniform mixture of grasses and clovers and broken up in eight different ways. When breaking from grasses and clovers, a season needs to be lost in order to allow the sod to become rotted and to allow the soil and subsoil to collect the moisture for the crop of grain to follow. In the past two seasons, one point has been clearly noticeable, and it is that when the sod is broken and seeded at once to wheat, no crop has resulted.

APPLICATION OF BARNYARD MANURE.

Green manure applied in winter on summer-fallow and disced in before seeding gave 2 tons 1,986 pounds of turnips, over summer-fallow treated in the same way without manure.

When roots were grown on wheat stubble the best results were obtained by applying green manure in winter on the stubble and ploughing under in the spring.

When applying manure for wheat, barley, and oats, green manure applied in winter on summer-fallow and disced in, gave about similar yields to top dressing with rotted manure with spreader, after grain sown on summer-fallow.

No important comparisons can be drawn from the application of manure on wheat, barley, and oats seeded on stuble, as this year's crop was a failure.

LETHBRIDGE.

GREEN MANURING.

This experiment consists of ploughing under peas and tares at different stages of maturity, compared with summer-fallow with and without barnyard manure. Peas ploughed under early in July gave better results than peas ploughed under when in blossom, or tares in late July. Compared with summer-fallow with manure (12 tons per acre) the three-year average succeeding crop of wheat gave an increased yield of 1 bushel 20 pounds per acre over peas ploughed under early in July. The yield of wheat following tares ploughed under in late July fell below summer-fallow without manure.

SEED-BED PREPARATION.

The experiment consists of three methods of seed-bed preparation for wheat on summer-fallow land treated alike. The terms "poor" "good" and "extraordinary" are used to designate the method employed.

The three-year average shows that harrowing the summer-fallow in the spring before seeding gives 8 bushels 20 pounds per acre of wheat more than seeding without any preparation. It is questionable whether the higher yield of wheat by extra work, on the summer-fallow in the spring before or after seeding, compensates for the work involved.

SOIL PACKERS.

The surface, subsurface, and combination packers are used in this experiment.

In ploughing for summer-fallow the three years average increase of ½ bushel of wheat per acre has been noted in favour of the subsurface packer.

Subsurface packing when the grain is 6 inches high gives about the same results as subsurface packing immediately after seeding.

There is very little difference in yield between the surface and combination packers.

DEPTH OF SEEDING.

Wheat and oats are sown from 1 inch to 4 inches deep. Both wheat and oats gave the highest yields when seeded 2 inches deep. In this connection the important point is to be sure that the seed is placed deep enough to be in moist soil.

CORN A SUBSTITUTE FOR SUMMER-FALLOW.

A hoed crop is generally considered to be a very good substitute for summer-fallowing, but one of the most striking lessons learned from this season's work at this Station has been the fact that there appears to be a marked difference from the kind of hoed crop used. In rotation "S" wheat follows corn, in rotation "T" wheat follows turnips, and in several other of the rotations wheat follows summer-fallow. The results, which are somewhat suprising and perhaps difficult to explain, are as follows:—

	1913.		1914.	
	Bush.	Lb.	Bush.	Lb.
Yield of wheat after turnips..	15	55	1	3
Yield of wheat after corn..	33	20	22	12
Yield of wheat after summer-fallow..	26	55	15	14

Both the corn and turnips are planted on summer-fallow and no spring cultivation is given, except a harrowing when necessary just previous to seeding. The yield from the summer-fallow in 1914 is the average yield of five different fields, the highest yield being 16 bushels 22 pounds, and the lowest being 14 bushels 4 pounds. The corn was cut for ensilage, and was weighed green. It yielded at the rate of 11 tons 718 pounds in 1913, and 12 tons 652 pounds in 1914. The reason for the wheat yielding so much better on corn stubble than on turnip land is doubtless due to the fact that corn not only requires less soil moisture, but that growth stops with the first killing frost, which is in early September, while in the case of turnips, perhaps the heaviest drain on the moisture in the soil begins about this time.

LETHBRIDGE.

It is difficult to offer a satisfactory explanation for the increased yield of wheat sown on the corn stubble over that sown on summer-fallow, unless it might possibly be the fact that manure, at the rate of 12 tons per acre, was applied to the land just before it was summer-fallowed for the corn. The same quantity of manure was applied, however, to the rotation in which the turnips are, but not just previous to the turnips. That a dry-land farmer can obtain a goodly supply of rough fodder for his stock by putting in a few acres of summer-fallowed land with Comptons Early or some similar variety of corn, and still have his land in excellent condition for a grain crop the following year is important, but there is another method opened to him. If he could use some extra early variety of corn that would mature the grain he would in one way be still farther ahead, for he could thus add materially to his supply of hog feed in the fall. None of the ordinary varieties can be relied on to do this, but the variety known as Squaw will mature. It has matured here every year since the Station has been established. It does not grow more than about 3 feet high, and the ears grow close to the ground and, although very small are numerous. To make the growing of Squaw corn practicable it would probably be necessary to allow the stock to pasture off the corn in the field during the fall and winter rather than attempt to harvest it.

An experiment was conducted this year to ascertain the feasibility of growing this corn on spring ploughed stubble. Land on which oats were grown in 1913 was ploughed 6 inches deep and immediately harrowed, marked, and planted, the hills being placed 3 feet apart each way. By having it check-rowed in this manner it was possible to cultivate both ways and thus keep the weeds down, with practically no hand work. Although the seed germinated very slowly and some of it was late in coming up, it all matured and yielded 16 bushels and 20 pounds of shelled corn to the acre. When the season, in which no wheat or oats were obtained except on summer-fallow, is considered, the yield of 16 bushels of corn planted on stubble land is certainly encouraging.

A farmer on a half section of land in this district should prepare at least 100 acres of summer-fallow each year. He should be able to get 40 to 60 acres of this ploughed in time to put it in with corn. With the proper machinery he should be able to plant this cheaply and quickly. The necessary work to keep it clean, provided it was planted in check rows, should not be much greater than that required to keep his summer-fallow clean. If, then, he could obtain 16 bushels or better of corn per acre he would be salvaging a pretty valuable crop from his summer-fallow, which would otherwise be yielding him nothing.

In these parts, which until recently have been used for range purposes, where the snowfall is light and does not remain long at a time on account of winds, it would certainly be feasible to pasture off a crop of this kind in the fall or winter by hogs, cattle, or sheep. If our mild dry winters were an asset in the ranching days, why not still make them so?

LETHBRIDGE.

PART II.—THE IRRIGATED FARM.

The crops on the irrigated part of the Station were satisfactory. In some cases phenomenally large yields were obtained, and in all cases the returns were remunerative.

INSTALLATION OF A PUMP FOR IRRIGATION.

One of the main distributing laterals of the Canadian Pacific irrigation system passes through the Station. There is a certain amount of land lying adjacent to this lateral that is too high to be irrigated by it, though nominally "below the ditch." By using a pump and lifting the water 6 to 7 feet it was possible to irrigate this land. In the spring of 1914 a 9-inch suction and 7-inch discharge rotary pump was installed. This was operated by one 20-horse-power International gasolene farm engine. We thus were able to irrigate about 100 acres more land than was possible by the ordinary gravity method. We collected data regarding the cost of lifting the water, but propose to obtain further data along this line in 1915 before publishing our results.

ROTATIONS ON THE IRRIGATED LAND.

Two rotations "U" and "V" have been established since 1911, and a new one, which is styled "X," was begun in 1914. They are as follows:—

ROTATION "U."

First year.—Seeding alfalfa.
Second year.—Alfalfa hay.
Third year.—Alfalfa hay.
Fourth year.—Alfalfa hay.
Fifth year.—Alfalfa hay.
Sixth year.—Alfalfa hay.
Seventh year.—Hoed crop.
Eighth year.—Wheat.
Ninth year.—Oats.
Tenth year.—Barley.

ROTATION "V."

Alfalfa continuously.

ROTATION "X."

This is a fifteen-year rotation. The land is in alfalfa ten years, then is broken and is in ordinary field crops for five. Instead of breaking up one field of alfalfa each year and seeding down a field each year, as is the case in rotation "U," the breaking is done but once in five years, then the five fields that have been used for ordinary cereal and field crops are all seeded down at once and five fresh fields are broken out and used for these crops. The rotation can be perhaps explained in the following manner:—

First year.—Seeding alfalfa.
Second year.—Alfalfa.
Third year.—Alfalfa.
Fourth year.—Alfalfa.
Fifth year.—Alfalfa.
Sixth year.—Alfalfa.
Seventh year.—Alfalfa.
Eighth year.—Alfalfa.
Ninth year.—Alfalfa.
Tenth year.—Alfalfa.
Eleventh year.—Barley
Twelfth year.—Corn.
Thirteenth year.—Wheat.
Fourteenth year.—Oats.
Fifteenth year.—Peas.

The following tables give details in regard to the results obtained from these rotations. The high yields in certain cases are worthy of note. The relatively low yield of barley in rotation "U" is due to the fact of the rotation being established such a short period of time. Up to the present the fields in which the barley has been sown have never been seeded down to alfalfa. In 1915 the cycle will be complete for the first time, and the barley will be sown on a field that was broken from alfalfa three years previously, and it is expected that the yield will be increased.

ROTATION "U"

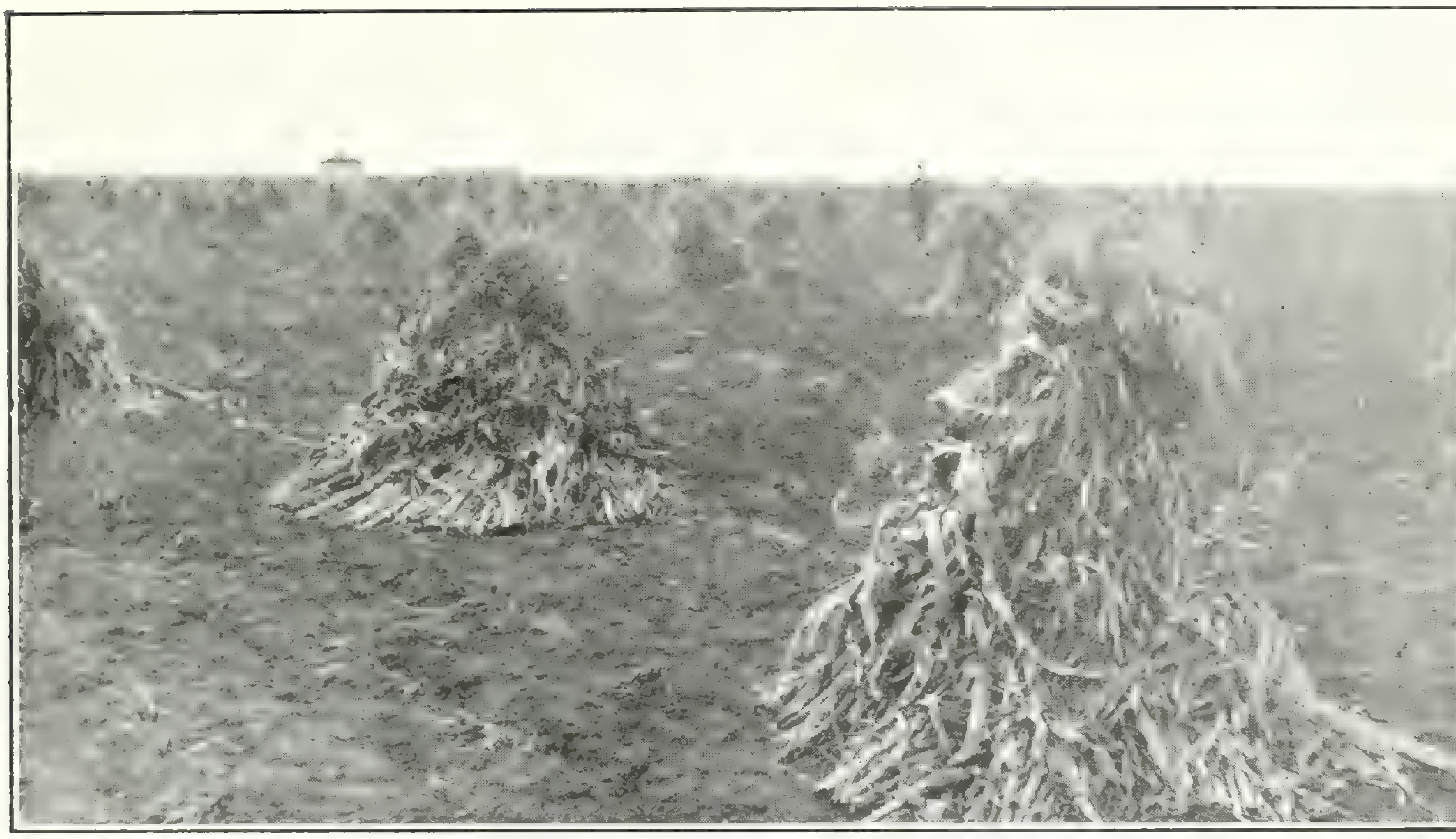
Rotation year.	Crops.		Area.	Items of Expense								
				Rent and manure.	Seed, twine and use of machinery.	Manual labour.		Horse labour (including teamster). Hours.				
						Hours.	Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
	1913.	1914.	Acres.	$ cts.	$ cts.	No.	$ cts	No.	No.	No.	No.	No.
1st...	Barley........	Seeding alfalfa.	1	4 20	2 60	8·33	1 58	.....	1·00	.....	5·45	......
2nd...	Seeding alfalfa.	Alfalfa hay...	1	4 20	2 60	24·66	4 69	2·25	7·42	.....	......	......
3rd...	Alfalfa hay.....	" "	1	4 20	2 60	22·25	4 23	2·75	7·08	......	......	......
4th...	" "	" "	1	4 20	2 60	20·42	3 88	2·75	7·25	......	......	......
5th...	" "	" "	1	4 20	2 60	22·69	4 31	2·85	7·71	......	......	......
6th...	" "	" "	1	4 20	2 60	24·58	4 67	3·17	9·0	......	......	......
7th...	" "	Potatoes......	1	4 20	16 87	175·25	33 30	9·41	4·5	......	28·50	......
8th...	Potatoes.......	Wheat........	1	4 20	2 64	9·33	1 77	......	......	1·50	·67	......
9th...	Wheat.........	Oats..........	1	4 20	2 07	7·25	1 38	......	......	·92	4·22	......
10th..	Oats...........	Barley........	1	4 20	1 94	7·25	1 38	......	......	·83	4·17	......
	Aggregate.....................		10	42 00	39 12	322·01	61 19	23·18	43·96	3·25	43·01	......
	Average per acre...............		......	4 20	3 91	32·2	6 12	2·32	4·39	·33	4·3	......

ROTATION "V"

	Alfalfa hay...	Alfalfa hay....	1·06	3 18	63	26·24	4·98	2·83	8·00	......	......	......

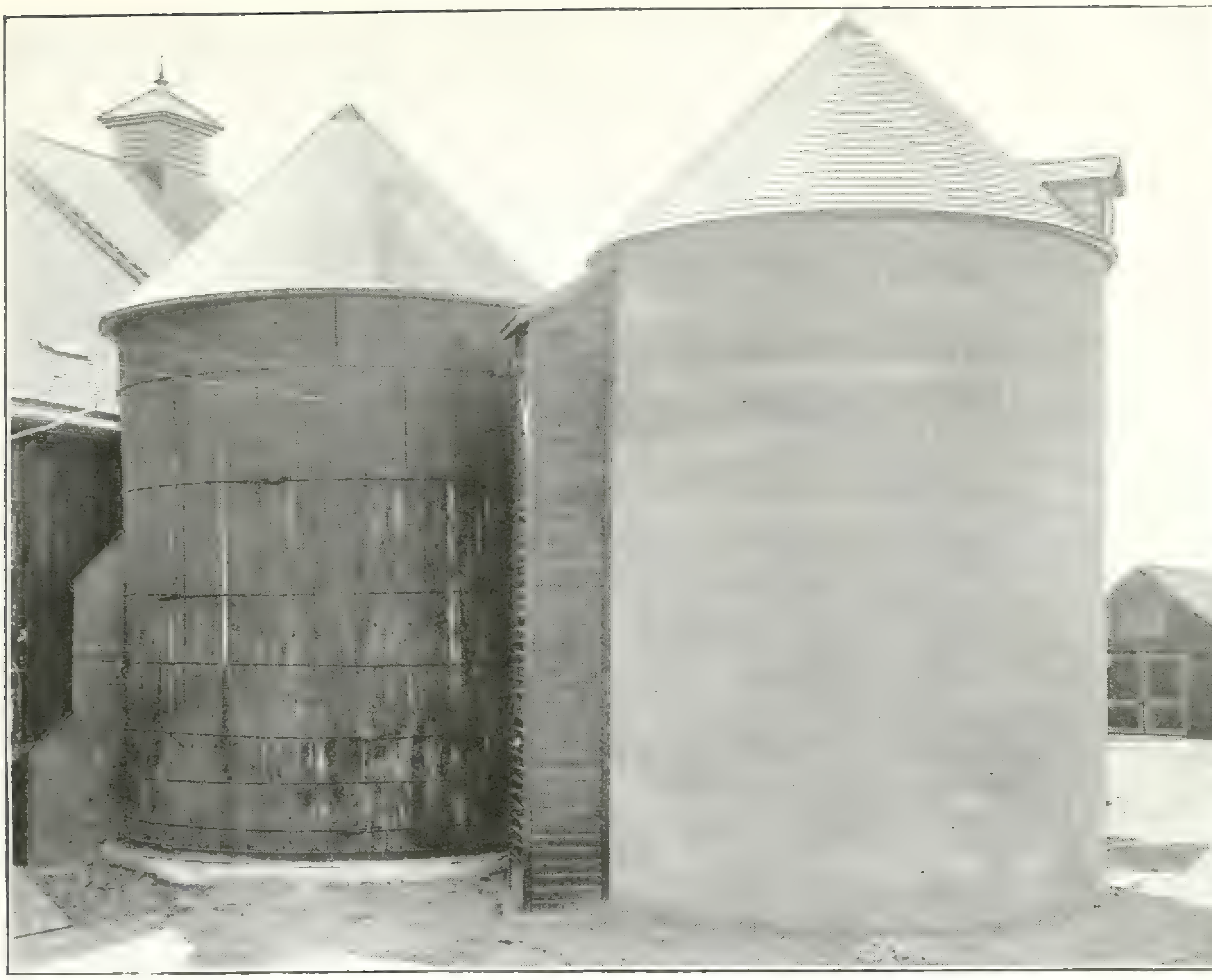
ROTATION "X"

1st...	Breaking.......	Barley.........	1	3 80	1 87	1·0	19	......	......	·82	·80	......
2nd...	"	Corn..........	1	3 80	3 70	4·75	9 03	4·25	......	......	2·5	......
3rd...	"	Wheat.........	1	3 80	2 34	·83	16	......	......	·83	·58	......
4th...	"	Oats..........	1	3 80	1 87	·83	16	......	......	·83	·58	......
5th...	"	Peas...........	1	3 80	2 70	1·0	19	1·6	......	·25	·58	......
6th...	....	Seeding alfalfa.	1	3 80	7 80	2·0	38	......	1·6	......	·90	......
7th...	....	" "	1	3 80	7 80	2·0	38	......	1·6	......	·90	......
8th...	....	" "	1	3 80	7 80	2·0	38	......	1·6	......	·90	......
9th...	....	" "	1	3 80	7 80	2·0	38	......	1·6	......	·90	......
10th..	....	" "	1	3 80	7 80	2·0	38	......	1·6	......	·90	......
11th..	....	Grain hay.....	1	3 80	1 60	5·0	95	·75	4·9	......	......	......
12th..	....	" "	1	3 80	1 60	5·0	95	·75	4·9	......	......	......
13th..	....	" "	1	3 80	1 60	5·0	95	·75	4·9	......	......	......
14th..	....	" "	1	3 80	1 60	5·0	95	·75	4·9	......	......	......
15th..	....	" "	1	3 80	1 60	5·0	95	·75	4·9	......	......	......
	Aggregate...................		15	57 00	59 48	43·41	16 38	9·60	32·75	2·48	9·54	......
	Average per acre........		......	3 80	3 97	2·89	1 09	·6	2·18	·17	·67	......



Lethbridge. Corn grown on rotation 'S' yielding 12 tons green feed per acre on dry land in 1914.

Cutting Corn, Experimental Station, Lacombe, Alta.



Brandon : Above-ground portion of new solid concrete silo, and also of old wooden stave silo.

Agassiz, B.C. Manure Spreader. An implement that has paid for itself in less than three years.

Agassiz, B.C. Green fir Stumps, 4 to 6 feet in diameter. These stumps cost $8 to $14 to destroy.

Agassiz, B.C. A good Blast. Stump left in best position for easy handling.

Agassiz, B.C. A poor Blast. Not enough powder. One-half of the stump still quite solid. Very expensive to finish getting it out.

Agassiz, B.C A poor Blast. Too much powder used. Two large pieces blown clear out ; one large piece blown 42 ft. from hole.

(ten years' duration).

In raising Crop.							Particulars of Crop.						
							Weight.						
Value of Horse labour.	Cost of threshing.	Total cost	Cost for 1 acre	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Root Crop	Total value.	Value of crop per acre	Profit or loss per acre
$ cts.	$ cts.	$ cts.	$ cts.	cts.	$ cts.	Ins.	Lb.	Lb.	Lb.	Lb.	$ cts.	$ cts.	$ cts.
2 96		11 34	11 34										11 34
3 15		14 62	14 62		2 81	3			10,390		62 34	62 34	47 72
3 15		14 18	14 18		2 91	3			9,960		58 56	58 56	44 38
3 21		13 89	13 89		3 27	3			8,505		51 03	51 03	37 14
3 39		14 50	14 50		3 12	3			9,300		55 80	55 80	41 30
3 92		15 39	15 39		3 06	3			10,050		60 30	60 30	44 91
17 75		72 12	72 12	12	4 00					35,875	295 95	295 95	223 83
94	4 48	14 03	14 03	22		10	3,815	5,500			53 60	53 60	39 57
2 40	4 28	14 33	14 33	13·4		9	3,633	2,630			38 98	38 98	24 65
2 34	2 30	12 16	12 16	26		7	2,210	1,370			23 47	23 47	11 31
43 19	11 06	196 56									700 03		
4 32	1·20		19 66									70 01	50 35

(Alfalfa continuously).

3 49		12 28	11 59		2 24				10 980		65 88	62 15	50 56

(Fifteen years' duration).

72	1 55	8 13	8 13	23			1,490	1,210			16 11	16 11	7 98
2 35		18 88	18 88							22,783	34 17	34 17	15 29
62	1 26	8 18	8 18				1,100	1,060			15 19	15 19	7 01
62	1 72	8 17	8 17				1,460	1,160			15 76	15 76	7 59
71	75	8 15	8 15	73			645	2,035			14 94	14 94	6 79
98		12 96	12 96										-12 96
98		12 96	12 96										12 96
98		12 96	12 96										-12 96
98		12 96	12 96										12 96
98		12 96	12 96										12 96
1 87		8 22	8 22						4,000		20 00	20 00	11 78
1 87		8 22	8 22						4,000		20 00	20 00	11 78
1 87		8 22	8 22						4,000		20 00	20 00	11 78
1 87		8 22	8 22						4,000		20 00	20 00	11 78
1 87		8 22	8 22						4,000		20 00	20 00	11 78
19 27	5 28	157 41									196 17		
1 28	35		10 49						..		..	13 07	2 58

In the following table the items of greatest interest in connection with the foregoing rotations are given.

ROTATION EXPERIMENTS.—Cost of operations, Value of Products and Profits.

Rotation.	Total cost per acre.	Total value per acre.	Net profit per acre 1914.	Average net profit per acre for 3 years.
	$ cts.	$ cts.	$ cts.	$ cts.
"U" (Ten years' duration)	19 66	70 00	50 34	53 25
"V" Alfalfa hay continuously	11 59	62 15	50 56	49 61
"X" Fifteen years' duration	10 05	13 07	3 03	....

LETHBRIDGE.

EXPERIMENTAL STATION FOR CENTRAL ALBERTA, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

WEATHER DURING GROWING SEASON, 1914.

The precipitation during the season of 1914 was normal, and the temperature during the growing season very slightly higher than the average. The seeding of grain began on April 15, and from that date until the close of the seeding season, conditions were favourable for the progress of spring's work and for the germination of seed and growth of plants. The first frost in the fall occurred on the 1st of September, and at this date most grain crops were so far matured as to be out of danger and already much of the earlier grain was in the shock.

Some Weather Observations taken at Experimental Station, Lacombe, 1914.

Month.	Temperature F.			Total Precipitation.	Sunshine.	Month.	Temperature F.			Total Precipitation.	Sunshine.
	Highest	Lowest.	Mean.				Highest	Lowest	Mean.		
	°	°	°	Inches.	Hours.					Inches.	Hours.
January	53·6	—36·1	9·3	1·45	73·5	July	87·6	39·3	62·25	1·11	316·8
February	48·6	—41·6	8·9	1·0	120·1	August	85·8	32·2	58·1	1·10	265·3
March	64·0	—23·6	26·65	·8	153·8	September	80·3	23·4	51·12	2·36	172·9
April	72·6	14·7	40·1	·34	174·2	October	77·0	19·9	47·1	·30	120·6
May	77·3	24·3	47·89	1·285	291·9	November	58·8	—18·1	40·39	1·5	84·8
June	84·8	36·1	55·81	6·07	218·7	December	48·8	—19·1	11·3	·98	66·1
Total for year										18·295	2058·7

ROTATIONS.

The tabular results of the rotations "C," "L," "K," and "O," are submitted herewith.

Attention is called to the results with rotation "L." These have been so satisfactory that a modified form of this rotation is being used on the large fields as the general rotation on the Farm. Instead of the fourth year being wheat we are substituting oats for this year on the main Farm. The profits per acre every year, with the exception of the years in pasture, are quite satisfactory. For the entire six years of the rotation the average net profit per acre is $7.60. This return is net after paying land rental, covering cost of farmyard manure, machine depreciation, etc., and would represent 7 per cent on a land capitalization of over $100 per acre.

While the amount of pasture produced in these rotations is not sufficient to cover the charges made against the land on the basis of $1 per month per head of stock carrying, yet we believe that the seeding of cultivated grasses for pasture pays, particularly on land carrying a fairly high valuation. The stock-carrying capacity of land under cultivated grasses is about double that of similar soil remaining in its natural state and producing the native grasses. The figures taken as a basis for the cost data submitted in the rotation tables may not meet with the approval of all western farmers. Objection has been made to charging $1 per ton for farmyard manure applied to the land. We believe results fully justify the value placed on such manure, and that the application of farmyard manure to even naturally fertile soil pays large dividends. Seven cents per hour for each horse is charged for horse labour, and manual labour is charged at the current wage. Sixty cents per acre per annum is charged to cover depreciation of machinery necessary to the production of the crop and, if reasonable care be taken of the machinery when not in use and the machine covers a fair acreage annually, the charge is sufficient. Whether objections be taken to the basis on which these figures are compiled or not, the importance of each farmer having some basis from which he may determine each year the cost of producing a bushel of grain or a ton of hay is apparent. Such cost data reveal the point at which loss is taking place, and make possible a curtailment of such losses and a consequent enlargment of profits.

ROTATION "C"

Rotation Year.	Crops.		Area.	Items of Expense								
				Rent and Manure.	Seed, Twine and use of Machinery.	Manual Labour.		Horse Labour (including teamster).				
								Hours.				
						Hours.	Cost.	Single Horse.	2-horse team.	3-horse Team.	4-horse Team.	5-horse Team.
	1913.	1914.	Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st....	Fallow..........	Wheat.........	1	2 00	2 60	2	0 38	.....	13½	¾	6	......
2nd...	Wheat..........	Wheat.........	1	2 00	2 60	1	0 19	.....	1¾	¾	6	......
3rd...	Wheat.......	Fallow........	1	2 00	0 60	......	......	......	10¾	......	¼	......
	Aggregate......................		3	6 00	5 80	3	0 57	.....	25¾	1½	12¼	
	Average per acre...............			2 00	1 93	1	0 19	.....	8·5	·5	4·1	.....

ROTATION "K"

Rotation Year.	1913.	1914.	Area.	Rent and Manure.	Seed, Twine and use of Machinery.	Manual Labour Hours.	Manual Labour Cost.	Single Horse.	2-horse team.	3-horse Team.	4-horse Team.	5-horse Team.
1st...	....	Hoed crop...	3·56	14 24	10 34	92¼	17 53	17¾	70½	46½	14¼	.....
2nd...	Hoed crop.....	Wheat.........	3·50	14 00	8 67	6	1 14	.....	1¼	2	13¼	.....
3rd...	Wheat.......	Barley........	3·41	13 64	6 56	11¼	2 13	.....	7¼	2¾	14¾	2
4th...	Barley......	Hay..........	3·53	14 12	7 17	10½	1 99	¾	17¼	.....	.....	.....
5th...	Hay.......	Pasture.......	3·63	14 52	5 56	.....	.....	.....	.....	.....	.....	.....
6th...	Pasture......	Pasture.......	3·60	14 40	5 41	.....	.....	.....	.....	.....	.....	.....
	Aggregate......................		21·23	84 92	43 71	120	22 79	18½	96¼	51¼	42¼	2
	Average........................		.....	4 00	2 06	5·65	1 07	·87	4·53	2·41	1·99	·10

ROTATION "L"

Rotation Year.	1913.	1914.	Area.	Rent and Manure.	Seed, Twine and use of Machinery.	Manual Labour Hours.	Manual Labour Cost.	Single Horse.	2-horse team.	3-horse Team.	4-horse Team.	5-horse Team.
1st.	Barley......	Hay..........	1·74	6 96	2 65	5	95	.....	8			.....
2nd...	Hay..........	Pasture.......	1·74	6 96	2 65	4	76	.....	2			.....
3rd...	Pasture......	Pasture.......	1 74	6 96	2 65		.....	.....	.....	.....	.....	.....
4th...	Pasture......	Wheat........	1 74	6 96	4 20	1·45	33	.....	19¼	.....	.....	.....
5th...	Wheat........	Oats..........	1·74	6 96	3 22	2·40	51	.....	4¼	.....	4	.....
6th...	....	Barley........	1·74	6 96	3 22	3	57	.....	4½	.....	4	.....
	Aggregate......................		10·44	41 76	18 59	15·85	312		38		8	..
	Average per acre...............			4 00	1 78	1·52	0 30		3·64	..	·76	

ROTATION "O"

Rotation Year.	1913.	1914.	Area.	Rent and Manure.	Seed, Twine and use of Machinery.	Manual Labour Hours.	Manual Labour Cost.	Single Horse.	2-horse team.	3-horse Team.	4-horse Team.	5-horse Team.
1st....	....	Potatoes......	2·42	6 92	38 45	218·5	41 51	11	64¼		1	
2nd...	....	Wheat........	2·42	6 92	6 07	1	19	.....	3¾	2¼	1⅙	..
3rd...	....	Oats.........	2 42	6 92	4 42	6·2	1 17	.....	4¼	3¼	15⅔	
4th.	....	Fallow........	2 42	6 92	1 45	3	0 57	.....	11⅔	..	19½	
5th...	....	Barley........	2 42	6 92	4 75	3	0 95	.....	3½	3⅓	22	.....
6th...	....	Hay..........	2·42	6 92	5 78	.....	.....					.....
7th...	....	Pasture.......	2·42	6 92	5 78	.....				.....		.....
	Aggregate......................		16·94	48 44	66 70	231·7	44 39	11·00	87·41	9·16	59·33	
	Average per acre...............			2 86	3 93	13·68	2 62	·65	5·16	·54	3·50	..

LACOMBE.

(Three years' duration).

…in Raising Crop.						Height of Stubble.	Particulars of Crop.						
							Weight.						
Value of horse labour.	Cost of Threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.		Grain.	Straw.	Hay.	Hoed Crop.	Total Value.	Value of crop per acre.	Profit or loss per acre.
$ c	$ c.	$ c.	$ c.	cts.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
7 78	2 36	15 12	15 12	45			2,030	5,810			29 97	29 97	14 85
3 69	1 98	10 47	10 47	37			1,700	3,450			24 39	24 39	13 92
3 77		6 37	6 3.										—6 37
15 24	4 34	31 96									54 36		
5 08	1 45		10 66									18 12	7 46

(Six years' duration).

54 65		96 76	27 18				38,596			60,277	148 21	41 13	13 95
7 60	9 95	41 36	11 82	90			8,530	17,055			122 25	34 92	23 10
11 89	4 85	39 07	11 45	40			4,642	7,450			53 87	15 80	4 35
5 01		28 29	8 01						16,035		80 17	22 71	14 70
		20 08	5 53								8 50	2 34	—3 29
		19 81	5 50								1 87	0 52	—4 98
79 15	14 80	245 37									414 87		
3 73	0 69		11 55									19 54	7 99

(Six years' duration).

2 72		13 28	7 63						4,659		23 29	13 38	5 75
0 68		11 05	6 35						2,095		11 14	6 40	0 05
		9 61	5 52								1 71	0 98	—4 54
6 54	4 06	22 09	12 69			6	3,480	6,125			49 46	28 36	15 67
3 37	3 75	17 81	10 23			6	3,220	4,820			37 02	21 27	11 64
3 45	2 04	16 24	9 33			6	1,964	3,148			22 78	13 09	3 76
16 76	9 85	90 08									145 40		
1 60	94		8 62									13 91	5 29

(Seven years' duration).

25 29		112 18	46 35							30,363	253 00	104 54	58 19
2 76	6 50	22 43	9 26				5,570	10,690			79 61	32 90	23 70
10 30	7 53	30 34	12 53				6,400	9,280			73 28	30 28	17 75
13 33		22 27	9 20										—9 20
13 12	4 56	30 29	12 52				4,380	10,164			53 96	22 30	9 78
		12 70	5 25								2 50	1 03	—4 22
		12 70	5 25								2 50	1 03	—4 22
64 80	18 59	242 91									464 85		
3 82	1 09		14 33									27 44	13 11

Lacombe.

FIELD PEAS.

An acre of "Arthur" peas was sown on land cleared and broken out of heavy brush in 1913. From this area 30 bushels of peas were threshed, and a part of the crop secured will be used for mixing with oats in 1915 for the production of green feed, while a slightly larger area of peas will be sown alone to maintain a supply of seed to be used annually for the production of peas and oat fodder. This variety of pea should prove satisfactory for the purpose, for while the amount of straw produced is less than is common to such varieties as Prussian Blue, the advantage of "Arthur" over such long-strawed varieties consists in the fact that it will ripen its seed, while varieties such as Prussian Blue have seldom done so here. A small field of peas sown alone each year will maintain a constant supply of seed for the green-feed area, and at a comparatively low cost per bushel, thus obviating the necessity of buying seed peas at high prices each year for this purpose.

GREEN FEED.

By seeding 1 bushel of peas and 2 bushels of oats to the acre a very satisfactory fodder has been obtained. Weighed green, a heavier tonnage was secured than was expected, and the quality when cured in the shock or put into the silo has been remarkably high. One and one-half acres of green feed produced 19 tons, green weight, when put over the scales prior to being put into the silo. We believe that where peas are used with the oats for green feed, or even if oats are sown alone that satisfactory ensilage may be made. Figures showing the relative nutritive value for cattle of oat ensilage, to green feed cured in the shock, and other bulky fodders may be seen in the report of the Animal Husbandry Division of this Station this year.

ERADICATION OF WEEDS.

Ample opportunity has been afforded on this Farm for testing different methods for the eradication of weeds. The orginal quarter-section purchased in 1907, and the major portion of the land bought in 1912 was polluted with weeds of various kinds, including ball mustard, wild buckwheat, wild oats, couch grass, and a small quantity of stinkweed.

The number of weeds in the crop is less year by year, and the methods responsible for their eradication are practical and simple. When the grain is cut, a disc, set to run rather shallow, follows immediately behind the binder as often as time and horse-power will permit. Fall ploughing to a depth of 6 inches is practised, and the land is packed with a surface or combination packer the day the ploughing is done. As a rule, there is sufficient moisture to start a crop of weeds, particularly when the ploughing and packing is done early. In the spring, as soon as the land is ready to work the drag harrow is put over all fall-ploughed land, which assists in warming the soil, providing a mulch, and also encourages the germination of weeds. These operations stimulate the growth of three or four crops of weed seeds and, in time, greatly reduce the number of weeds in the growing crop without the loss of a year for summer-fallow. Our chief objection to summer-fallow in this class of land is that the crop following summer-fallow is usually so heavy that it lodges and the grain does not fill properly. The crop, being lodged, is difficult to harvest and, consequently,the profits from land growing crops on summer-fallow are not as great as are realized from land not devoted to summer-fallow. The quality of the grain is also better on non-summer-fallowed soil. The six-year rotation to which reference has already been made calls for the application of 12 tons of barnyard manure to the acre during the fall and winter following hay crop.

The manure thus applied is distributed over the hay stubble, and many weed seeds germinate during the rainy season in the small particles of manure; later these plants are destroyed because of lack of moisture, but the vitality of such weed seed is lost and, when the manure is incorporated with the soil later, many seeds are harmless which were vital when the manure was applied.

SOIL CULTURAL EXPERIMENTS.

SUMMER-FALLOW TREATMENT.

The conclusions previously drawn are again borne out by the results for the season of 1914. It is an advantage to plough but once for summer-fallow. The ploughing should be done to a depth of about 6 inches.

DEPTH OF PLOUGHING.

Deep ploughing in stubble and sod taken over an average of the years, gives highest yields.

STUBBLE TREATMENT.

Fall ploughing 6 inches deep has given increased yields of from 2 to 10 bushels to the acre as compared with discing the stubble in the fall; and also superior results to either burning the stubble in the fall or spring, or to spring ploughing.

OTHER TRIALS.

Before publishing results of the other cultural tests under way, another year's work at least will be necessary to justify conclusions and warrant publication.

FENCING AND BREAKING.

Over 2 miles of woven-wire fence was erected. This fence runs nine wires high with ten perpendicular wires to the rod, and all No. 9 gauge. A block of about 10 to 15 acres of land was cleared on the new Farm, and is ready for the breaking plough in the spring of 1915. A few acres were broken out during the season; these were small strips of land where fences formerly stood and the fact that they can now be cultivated in the usual way will facilitate this work by increasing the length of the furrows in this field.

LACOMBE.

EXPERIMENTAL STATION, INVERMERE, B. C.

REPORT OF THE SUPERINTENDENT, G. E. PARHAM.

WEATHER CONDITIONS.

The spring of 1914 opened unfavourably with uniformly low temperatures throughout April and May, and a great deal of cold wind, which checked plant growth. Frost was registered on sixteen nights during the month of April. The minimum mean temperature for the month was only 23° above freezing point; and July was the only month of the year without frost. The rainfall during the growing months was rather above the average, but the character of soil and subsoil is such that a much greater amount of precipitation might have been experienced with gain to the field crops. August was dry, and this necessitated much late irrigation. On the whole, the results on the irrigated land were satisfactory, while those on the non-irrigated plots were poor.

The frost was out of the ground by the end of March, and the plots were laid out early in April, but this being the first year for this work much levelling was necessary to facilitate irrigation, and some of the crops therefore were sown rather late.

Some Weather Observations taken at the Invermere Experimental Station, 1914.

Month.	Temperature F.			Precipitation.			Heaviest in 24 hrs.	Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.		
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	46	—11	22·49	·66	10·05	1·71	0·48	54·5
February	46	—27	21·66	.....	5·00	0·50	0·25	73·6
March	53	— 5	31·23	0·07	3·25	0·39	0·27	144·8
April	71	22	43·84	1·25	.....	1·25	0·59	165·1
May	87	28	51·98	1·46	.....	1·46	0·70	237·1
June	85	34	56·91	1·59	.....	1·59	0·76	198·4
July	95	42	64·48	1·57	.....	1·57	0·69	314·5
August	95	33	60·72	0·75	.....	0·75	0·27	267·9
September	80	33	49·78	2·16	.....	2·16	0·64	148·3
October	66	24	41·77	0·77	.....	0·77	0·24	86·7
November	51	3	30·68	0·39	4·00	0·79	0·40	56·4
December	35	—16	11·70	4·25	.....	0·42	0·27	86·8
Total for year	.....	.....	.....	14·92	22·3	13·36		1,834·1

ROTATION OF CROPS.

Four rotations varying in duration and treatment were started last year. They are as follows:—

ROTATION "A" (FOUR YEARS' DURATION).

First year.—Roots.

Second year.—Wheat.

Third year.—Peas.

Fourth year.—Oats.

Plots of one-half an acre each are used for this rotation. The plots are to be irrigated as required, and fluming has been installed in order that an exact record may be kept of the amount of water used. The pea crop will be ploughed under in order to supply the much-needed humus to the soil. The subjoined tables give a summary of the observations made in this and the following rotations.

ROTATION "B" (FIVE YEARS' DURATION)—A MIXED FARMING ROTATION.

First year.—Wheat.
Second year.—Roots.
Third year.—Oats, seeded down.
Fourth year.—Clover.
Fifth year.—Clover.

The plots for this rotation are of one-half an acre. Irrigation will be used as required, but no exact record will be made of the amount of water used. It is a mixed farming rotation, supplying hay, roots, and grain, and will probably be a suitable one for this district.

ROTATION "C" (TWO YEARS' DURATION).

First year.—Oats.
Second year.—Summer-fallow.

Plots of one-quarter acre are used for this rotation, which is intended to demonstrate the evils of a system of cultivation which has been practised considerably in this district.

It may reduce the necessity of irrigation, but the system has no doubt impoverished the land, encouraged many weeds difficult to eradicate, and depleted the soil of humus.

ROTATION "D" (TEN YEARS' DURATION)—A DRY FARMING ROTATION.

First year.—Summer-fallow.
Second year.—Alfalfa.
Third year.—Alfalfa.
Fourth year.—Alfalfa.
Fifth year.—Alfalfa.
Sixth year.—Summer-fallow.
Seventh year.—Hoed crop.
Eighth year.—Grain.
Ninth year.—Summer-fallow.
Tenth year.—Grain.

The plots in this rotation are also one-quarter acre each. There will be no irrigation. The alfalfa will be sown in drills 28 inches apart, which will take 4 pounds of seed to the acre. One application of farm manure will be given in the eighth year after the grain has been harvested.

The alfalfa sown the last day of June made a good start. The returns in roots and grain in this the first season, were poor, but one has to take into consideration the fact that no special preparation for dry farming had been made.

INVERMERE.

ROTATION "A"

First year........................Roots.
Second year.......................Wheat.

Plot.	Acreage	Crop.	Date sown.	Quantity of seed per acre.	Variety.	Manuring. Date.	Manuring. Kind.	Manuring. Quantity per acre.
	Acre.							
1	½	Roots.....	May 19..	....	16 rows turnips....	May 9..	Farm Manure...	....
....		....	....	....	11 rows mangels...	July 7..	Nitrate of Soda	100 lb.....
....		....	....	....	4 rows sugar beets	....	....	....
2	½	Oats......	May 21..	2½ bush...	Abundance........	....	....	....
3	½	Peas......	May 22	1¾ bush...	Golden Vine......	....	....	....
....		Rape.....	May 28..	4 lb.......	....	July 28..	Superphosphate.	200 lb.....
4	½	Oats......	May 20	2½ bush...	Abundance........	....	....	....

ROTATION

1	½	Roots.....	May 20..	....	16 rows turnips..	May 16..	Farm manure..	....
....		....	....	....	11 rows mangels...	July 7..	Nitrate of soda.	100 lb.....
....		....	....	....	4 rows sugar beet	....	....	....
2	½	Oats......	May 21..	2½ bush...	Abundance........	....	....	....
3	½	*Rape.....	July 18..	4 lb.......	....	July 22...	Superphosphate.	200 lb.....
4	½	Oats......	May 21..	2½ bush...	Abundance........	....	....	....
....		Clover....	May 21..	11 lb......	....	....	....	....
5	½	Clover....	June 23..	11 lb......	....	....	....	....

ROTATION

1	½	Oats......	May 20	2½ bush..	Abundance........	....	....	....
2	½	Summer-fallow..	....	....	....	....	....	....

ROTATION

1	¼	Alfalfa....	June 30..	4 lb.......	Grimm's.......	....	....	....
2	¼	Alfalfa....	June 30..	4 lb.......	Grimm's.......	....	....	....
3	¼	Alfalfa....	June 30..	4 lb.......	Grimm's.......	....	....	....
4	¼	Summer-fallow ..	....	....	....	....	....	....
5	¼	"	....	....	....	....	....	....
6	¼	Swedes....	June 1..	....	N. Western.....	....	....	....
7	¼	Wheat....	May 21	1½ bush..	Marquis.......	....	....	....
8	¼	Summer-fallow..	....	....	....	....	....	....
9	¼	Wheat....	May 21	1½ bush...	Marquis........	....	....	....
10	¼	Barley....	May 22..	1½ bush...	Mensury........	....	....	....

*See separate table.

INVERMERE.

(Four years' duration).

Third year.........................Wheat.
Fourth year.......................Oats.

Cultivating.		Dates of			Yield per acre.
Date.	Operation.	Irrigating.	Cutting.	Harvesting.	
July 2	Singling to 10 inches *.		October 8	October 12	18 tons, 1,398 lb.
July 7	Horse hoeing				8 tons, 1,790 lb.
October 16	Ploughing				8 tons, 1,402 lb.
October 20	Ploughing		August 22	August 27	28·29 bushels.
July 27	Ploughed in				
October 13	Ploughing				
November 4	Ploughing		August 25	August 27	33·64 bushels.
"B"					
July 8	Singling to 10 inches		October 13	October 15	17 tons, 1,631 lb.
July 13	Horse hoeing				8 tons, 1,514 lb.
October 18	Ploughing				7 tons, 404 lb.
			August 25	August 27	25·47 bushels.
October 14	Ploughing				
			August 25	August 27	35·05 bushels.
"C"					
October 21	Ploughing		August 21	August 27	34·64 bushels.
"D"					
November 7	Ploughing		October 22	October 24	
August 29	Ploughing		August 19	August 20	8·6 bushels.
August 21	Ploughing		August 19	August 20	9·1 bushels.
August 19	Ploughing		August 14	August 18	12·5 bushels.

INVERMERE.

Table showing irrigation of Rotation "A" during season 1914.

Plot.	Irrigating.		Hours.	Inches on weir.	Discharged cubic feet per second.	Acre inches.	Waste in acre inches.	Net flow in acre inches.	Acre inches per acre.
	Commenced.	Ended.							
1	June 24, 9 a.m.	June 24, 5 p.m.	8	$3\frac{3}{4}$	0·1389	1·111	none.	1·111	2·22
	August 1, 8 a.m.	August 1, 5 p.m.	9	$4\frac{1}{4}$	0·1899	1·709	0·070	1·639	3·28
(Roots)	August 24, 7 a.m.	August 24, 6 p.m.	11	$4\frac{1}{4}$	0·1899	2·089	0·310	1·779	3·56
	August 25, 7 a.m.	August 25, 6 p.m.	11	$4\frac{1}{4}$	0·1899	2·089	0·231	1·858	3·72
		Totals........	....	....	....	6·998	0·611	6·387	12·78
2	July 6, 8 a.m.	July 6, 5 p.m.	9	$3\frac{3}{4}$	0·1389	1·250	none.	1·250	2·50
(Oats)	July 7, 8 a.m.	July 7, 5 p.m.	9	$4\frac{1}{4}$	0·1899	1·709	0·015	1·694	3·39
		Totals........	....	....	....	2·959	0·015	2·944	5·89
3	July 8, 8 a.m.	July 8, 5 p.m.	9	$4\frac{1}{4}$	0·1899	1·709	none.	1·709	3·42
	July 9, 7 a.m.	July 9, 1 p.m.	6	$4\frac{1}{2}$	0·2191	1·315	0·116	1·199	2·40
(Peas)	August 20, 2 p.m.	August 20, 6 p.m.	4	$3\frac{1}{2}$	0·1169	0·467	none.	0·467	0·93
	August 21, 7 a.m.	August 21, 6 p.m.	11	$3\frac{1}{2}$	0·1169	1·286	0·042	1·244	2·49
	August 22, 7 a.m.	August 22, 5 p.m.	10	$3\frac{3}{4}$	0·1389	1·389	0·310	1·079	2·16
		Totals........	....	....	....	6·166	0·468	5·698	11·40
4	July 9, 1 p.m.	July 9, 5 p.m.	4	$4\frac{1}{2}$	0·2191	0·876	none.	0·876	1·75
(Oats)	July 10, 7 a.m.	July 10, 6 p.m.	11	$4\frac{3}{4}$	0·2508	2·759	0·140	2·61	5·24
	July 11, 7 a.m.	July 11, 12 n.	5	$4\frac{3}{4}$	0·2508	1·254	0·116	1·13	2·28
		Totals........	....	....	....	4·889	0·256	4·633	9·27

Total water used in four plots, 19·662 acre-inches, *i.e.*, 9·831 inches per acre.

The soil is a light sandy loam, deficient in humus, about 12 inches deep, with moraine subsoil.

INVERMERE.

EXPERIMENTAL FARM, AGASSIZ, B. C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

WEATHER CONDITIONS.

The weather during the past calendar year has been the best in many years for promoting good field work. July, August and December, were three almost rainless months. During the remaining nine months, over 60 inches of precipitation were recorded, which was ample for all crop growth.

Some Weather Observations taken at Agassiz Experimental Farm, 1914.

Month.	Temperatures.					Total Precipitation.	Total Sunshine.
	Maximum.		Minimum.		Mean.		
	Date.		Date.		Degrees.		
		°		°	°	Inches.	Hours.
January	4, 6, 11	49	28	12	38	13·96	12·6
February	26	60	6	12	39·56	4·06	66·9
March	19	73	26	22	45·02	3·12	98·5
April	21	72	1	31	51·55	2·94	143·9
May	22	85	4	36	56·28	3·55	202·0
June	15	87	4	39	52·91	5·18	176·3
July	17	87	6	40	62·07	0·15	246·9
August	19	87	3	44	62·995	0·60	224·5
September	23	78	25, 27, 30	40	52·33	6·29	60·5
October	15	71	4	34	50·4	7·53	111·5
November	10, 28	52	16	28	42·6	14·72	36·3
December	2, 8	49	21	16	35·235	0·53	80·3
Total						62·63	1,460·2

FIELD CROPS.

Following out the four-year rotation, which was started in the spring of 1911, we have this year covered the last remaining section of the Farm with a hoed crop.

This year there were grown for stock feed the following crops:—

	Tons.	Lb.
Corn silage	211	710
Clover silage	124	....
Mangels	84	1,450
Turnips	6	155
Carrots	3	1,520
Sugar beets	....	1,820
Potatoes	9	1,200
Mixed grain	15	753
Barley	1	356
Oats	1	782
Peas	....	1,200
Clover hay	82	800

This gave a total of 437 tons 1,041 pounds silage and root crops; 82 tons 800 pounds of hay crop; and 18 tons 1,091 pounds grain. There was a sufficient quantity of roughage to carry all our stock over the winter and allow enough silage for summer feeding this coming season.

The corn crop consisted of two varieties, viz: Longfellow and Comptons Early, the seed being procured from growers in Ontario. Both varieties were very poor. The germination was very weak, and consequently the stand was much inferior to that of other years. This condition affected our total yield greatly.

The mangel crop consisted of one-half each of Danish Sludstrup and Perfection Long Red. Both varieties gave good yields in field conditions. A trial was made with large quantities of commercial fertilizer per acre on three one-quarter acre plots. All the plots had a dressing of 20 tons of barnyard manure, and the following results will give some idea of the quality of the land under hoed crop:—

Plot No.	Treatment.	Yield per acre.			
		1914.		Average for 3 years.	
	Per acre.	Tons.	Lb.	Tons.	Lb.
1.........	No commercial fertilizer........	4	60	12	102
2.........	160 pounds nitrate of soda........ 160 pounds muriate of potash. 400 pounds superphosphate.	25	87	26	1,589
3.........	160 pounds nitrate of soda........ 400 pounds superphosphate.	22	32	25	333

This season there were prepared 205 plots for permanent cultural and fertilizer experiments. One hundred and forty of these will be devoted to a four-year rotation in an endeavour to ascertain:—

(1) The best methods for preparing land for hoed crops (corn and roots).

(2) The best seasons for applying manures.

(3) Methods of applying chemical fertilizers to mangels.

(4) The best after-harvest cultivation of root land in preparation for a grain crop, to be seeded with clover.

Sixty-five plots are devoted to fertilizer work, both barnyard and chemical, the object being to ascertain the rate of application for most economical gains.

A description of the field is here given. Ranges one and two are being used for fertilizer work, and the four remaining ones are for cultural experiments. This field has been under preparation since 1911. In 1911 it was ploughed from sod and planted to corn; in 1912 it was sown to grain and seeded to clover. In 1913 two crops of clover were harvested and the third ploughed under. In 1914 it was laid off in plots and sown to oats as a control crop. Careful notes were kept on the condition of this crop with a view to detecting any natural variations in the plots.

DRAINING.

During the season, 3,800 feet of the main ditch at the back of the Farm were cleaned out and put in good shape. The brush and grass was cleared away to a distance of 10 feet on either side, and the sides were cleared and sloped. From 6 inches to 2 feet of earth were cleaned from the bottom.

AGASSIZ.

FENCING.

The amount of new fencing erected this year was not very great, but a great deal of work was performed repairing some of the original fences.

The new fence erected amounts to 1,900 feet. Part of this, 1,200 feet, was put along a lane where there are some other styles, so as to make a comparison between them.

The posts in over 9,000 feet of fencing received a coat of white paint, which added greatly to their appearance.

LAND CLEARING.

During the year, some 14 acres of land have been cleared and prepared for crop. This work was done through the different seasons of the year. Mr. A. McKay, farm foreman, is responsible for all the clearing operations, and has supplied the figures and information which we have to give. The work was done by him in a thorough, pains-taking manner, and the long experience which he has had in land clearing in this section makes this work the more valuable to those intending to clear similar land.

The major portion of the land cleared was covered with a heavy growth of Douglas fir, birch, maple, alder, vine maple, and a thick undergrowth of hazel and salmon berry. In all of this there was a large amount of old, semi-decayed fallen timber. On the average, this dead timber amounted to ten trees per acre. In an ordinary season this dead material is more difficult to handle than the green wood, since, in most cases, it is too rotten to blast, and it is so wet, as a rule, that it must be chopped up with mattocks, piled by hand and mixed with green wood before it will burn at all.

Of the green material, there were 10·9 fir stumps of from 4 to 6 feet in diameter per acre. The smaller hardwood ranged from 8 to 15 inches in diameter, and the average acre contained 315 stumps. Besides this, there were clumps of hazel and vine maple so large that it was found cheaper to blast them than to try to pull them with horses. This made at least 425·9 stumps or stump equivalents of all sizes to be blasted per acre on the roughest 7 acres. The remaining 7 acres contained many dead stumps and much fallen timber and were not so difficult to clear.

The surface of the land was very rough. It was piled up in hummocks as a result of the falling of large trees in past years. These had carried up large quantities of earth with their roots.

METHOD OF CLEARING.

The first operation was to clean up all the undergrowth; then all the standing timber, excepting the large firs, was cut and put into windrows. At this stage, if it was so desired, any material required for fuel could be taken out. The trees being in full leaf and the season favourable for drying, these windrows were fired about ten days after cutting, resulting in an excellent burn. Following this burning, all the old logs that would split were blasted and fired. Then all the very rotten logs and the remaining portions of green material were piled and completely burned. The three principal reasons for burning and piling at this stage are:—

(1) To have a reasonable quantity of fuel to consume the wet, rotten logs.

(2) To confine the fire to restricted areas, and thus save humus.

(3) To prevent all this small and rotten material from being buried by the soil, which is naturally thrown up by the blasting of the stumps.

All the small stumps were blasted next, then as the big stumps were thrown up, all the small ones could be pulled and piled into the holes. By this means the fire was confined to subsoil burning, and the fir stumps, having so much pitch in them it was possible to readily burn all material that could be hauled and piled in these holes.

The following equipment was used:—

One $\frac{5}{8}$-inch wire cable, 175 feet long. This was cut in five pieces, two of 50 feet, three of 25 feet. These pieces were fitted with hooks and rings, to run through the blocks.

Three iron snatch-blocks, with 8-inch shieve.

Two $\frac{7}{8}$-inch wire chocker cables, 10 feet long, fitted with loop at one end and flat hook at the other.

One steel bar, 6 feet long by 1 inch, flattened at one end for cutting roots, and having a small scoop at the other end.

One long-handled shovel, cut and curved to fit an 8-inch hole under the stumps.

Two augers, one 6 feet long by 2 inches, to bore under small stumps. One 4 feet by $1\frac{1}{4}$ inches for splitting logs.

Small tools, such as axes, mattocks, shovels, saws, chain, etc.

COST OF CLEARING.

The average cost per acre for the 14 acres, for clearing ready to plough, was $145.39. The cost for breaking, which was an exceptionally good job, was $10.84 per acre. Picking up roots and small sticks, etc., after breaking, cost $1.57 per acre. Harrowing, discing, levelling, and sowing cost $6.42 per acre. This is the average of 7 acres only, but it is for the roughest part. At the time of writing, the remaining 7 acres are not sown.

The land received five harrowings, four discings, and was then rolled and seeded. These figures are based on the current rate of wages here:—

Labour, 20 cents per hour.
Teamster, 24·5 cents per hour.
Horse labour, 25 cents per hour per team.
Depreciation on equipment, 15 per cent.

The expense items per acre are classified as follows:—

Manual labour	$ 105 78
Horse labour	12 50
Powder, caps and fuse	26 08
Interest on equipment	1 03
Total	$ 145 39

The main object this year was to get a good piece of land cleared and to get some figures on the method used, for a basis on which other methods could be compared. This being the case, not many experiments were made excepting in the detail work. On this we give a few notes.

The difference between handling small, green stumps (15 inches in diameter) after blasting, by direct draught, or with cable and blocks was noted. For this work, twenty stumps of comparable size were chosen. Of these, ten were blasted so as to allow them to be hauled out with a team by the aid of cable and blocks. The other ten had to be blasted more heavily in order that they might be hauled out with a team by direct draught. The comparison is as follows:—

TWENTY Stumps blasted and pulled.

—	Ten by cable and blocks.		Ten by direct draught.	
Powder	7·5 pounds at 10·5 cents	$0·78	11 pounds at 10·5 cents	$ 1·15
Caps	10 at 0·65 cents	0·065	10 at 0·65 cents	0·065
Fuse	18 feet at 0·55 cents	0·099	18 feet at 0·55 cents	0·099
Manual labour	7·5 hours at 20 cents	1·50	10 hours at 20 cents	2·00
Teamster labour	2·3 hours at 24·5 cents	0·56	5·5 hours at 24·5 cents	1·34
Horse labour	2·3 hours at 25 cents	0·575	5·5 hours at 25 cents	1·37
Total cost		$ 3·579		$ 6·024
Average cost per stump		·35		0·60

As will be seen, the light blasting and pulling by a cable and blocks is the most economical. Even if one allowed 100 per cent depreciation on the outfit, there would still be room for argument in favour of that method, if one had 5 acres to clear.

A spot was chosen where some trees had been cut several years ago; the stumps had not been allowed to "sucker," and were commencing to decay. Ten of these were taken out, and, even as compared to the light blasting and pulling, were found much less expensive. The cost per stump of equal size was 17 cents for the dead ones as compared to 35 cents, or 17 cents to 60 cents for green stumps. The chief difference in cost lay in the quantity of powder required, and the amount of team and manual labour.

A comparison was made between the cost of felling big trees by burning and by sawing. These trees averaged 125 feet high and 4 feet 6 inches on top of the stump. To burn down each tree took 2 pounds powder, 2 caps, 4 feet fuse, and one-half hour of labour, making a total cost of 34·5 cents. It took the trees from three to five hours to burn down. To fell a tree the same size by sawing took two men 4 hours, which cost $1.60. The expense in burning trees down is a great deal less, but there is a certain element of chance connected with it. After the charge is exploded a fire is started in the wound and is then left to burn at will. If this fire happens to strike down it may burn the stump off close to the ground, in which case the stump is more costly to get out than if the tree had been felled by the saw. When the heart is once burned out of a stump it is hard to handle.

A few figures are here given to show the cost of handling a big tree after it is down. The best method used was splitting and burning. An inch and a quarter auger hole is bored into the heart of the tree about 12 feet from the butt. A small charge of powder is put in and the tree split. A fire is started in the small crack and another charge is put in further up the tree, the distance depending upon the length of the first crack. This is continued until the tree is split throughout its entire length. The fire does not need any attention until the tree is nearly consumed; at this stage all the branches can be piled, along with the unburned portions, and all destroyed at once. If one has sufficient experience, all the holes can be made and filled and all the shots put off at one time. This is a saving of time, if other men are working in the field.

An average tree will take 5 pounds powder, 20 feet fuse, 10 caps; also four hours' labour blasting, and five hours' labour cutting branches and burning same, the total cost being $2.50 per tree of about 7·5 cords, exclusive of limbs.

To destroy the stump of a tree, such as the one just described, cost as follows: 27·5 pounds powder, 10 feet fuse, 2 caps, 12 hours' teamster labour, 12 hours team labour, and 12 hours manual labour, making a total cost of $11.28. This cost will vary from $8 to $14 per stump, depending upon the success of the blast. The work just described represents the most difficult stumps that one would have to blow out and destroy.

 AGASSIZ.

Stumps of trees which had been cut about ten years, and that were sound, but dry, cost much less. The average cost of stumps of this kind is as follows: Powder 24 pounds, 4 caps, 8 feet fuse, labour 11 hours, teamster 1 hour, team 1 hour, making a total cost of $5.28. This class of stump averaged 5 feet in diameter 4 feet above the ground.

In destroying a large stump the cost depends upon its condition after the blast. Properly blasted, the stump should be split into five or six sections, and these sections should stand up around the hole. If any of the sections are blown clear out of the hole and any distance away, the cost of handling this portion is almost as much as that of destroying the remainder of the stump.

The stumps cost less for powder when the ground is full of moisture, as it is in the winter, but the small material and all rotten or fallen timber is much more cheaply destroyed during the dry weather in summer.

Agassiz.

EXPERIMENTAL STATION, SIDNEY, B.C.

REPORT OF THE FOREMAN MANAGER, S. SPENCER.

WEATHER CONDITIONS AND CROP NOTES.

The spring season commenced early in April, with fine weather and light showers of rain. Fall wheat and rye sown in November, 1913, made 12 inches growth during the month. Timothy, rye grass, and clover were also showing good growth. However, owing to the cold nights in June and the very dry weather of May, June and July, the yields were small but the crops were good in quality and free from disease. This will provide seed for next season.

SOME Weather Observations taken at Sydney Experimental Station, 1914.

1914.	Highest.	Lowest.	Mean.	Precipitation.	Total Sunshine.
	°	°	°	Inches.	Hours.
January	52·2	28	30·10	8·47	35·1
February	51	24	42·97	3·21	140·5
March	67	29	44·26	1·26	126·5
April	68	34	50·38	1·63	172
May	82	40	56·00	0·28	293
June	83	38·5	58·50	2·14	281
July	85·5	44	64·23	0·13	342
August	83·5	46	62·36	0·14	300·2
September	72	41·5	54·07	1·97	87·4
October	66	39	51·90	3·63	94·4
November	56	32	46·30	8·20	46·3
December	41·6	34	37·80	1·21	72·56
Total				32·27	1,990·96

CROP YIELDS.

Crop.	Variety.	Area.	Yield per acre.	Total yield.
		Acres.	Bushels.	Bushels.
Wheat	Marquis	7·7	27	207·9
Oats	Victory	14·5	38	551
Oats	Banner	1	66	66

ROTATION OF CROPS.

Next season rotation "C" (four years' duration) will be commenced on approximately 35½ acres. Drainage operations will also be started on this area and continued until the 35½ acres are drained.

DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF ANIMAL HUSBANDRY

ON

BEEF CATTLE, DAIRY CATTLE AND DAIRYING, HORSES, SHEEP AND SWINE

FOR THE FISCAL YEAR ENDING MARCH 31, 1915.

PREPARED BY

The Dominion Animal Husbandman, Central Farm, Ont.	E. S. Archibald, B.A., B.S.A.
Superintendent—	
Experimental Station, Charlottetown, P.E.I. - - -	J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S. - - - - - - - -	W. W. Baird, B.S.A.
Experimental Station, Kentville, N.S. - - - - - - -	W. S. Blair.
Experimental Station, Fredericton, N.B. - - - - - -	W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, P.Q.	J. Bégin.
Experimental Station, Cap Rouge, P.Q. - - - - - -	Gus. A. Langelier.
Experimental Station, Lennoxville, P.Q. - - - - - -	J. A. McClary.
Experimental Farm, Brandon, Man. - - - - - - -	W. C. McKillican, B.S.A.
Assistant to the Superintendent—	
Experimental Farm, Indian Head, Sask. - - - - - -	K. MacBean, B.S.A.
Acting Superintendent—	
Experimental Station, Scott, Sask. - - - - - - - -	M. J. Tinline, B.S.A.
Superintendent—	
Experimental Station, Lethbridge, Alta. - - - - - -	W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta. - - - - - - -	G. H. Hutton, B.S.A.
Experimental Farm, Agassiz, B.C. - - - - - - - -	P. H. Moore, B.S.A.

REPORT

FROM THE

DIVISION OF ANIMAL HUSBANDRY

OTTAWA, March 31, 1915.

J. H. GRISDALE, Esq., B. Agr.,
Director, Dominion Experimental Farms.
Ottawa.

SIR,—I have the honour to submit herewith reports upon the beef cattle, dairy cattle and dairying operations, horses, sheep, and swine on the Central Experimental Farm and branch Farms and Stations for the past year.

The main cattle barn, calf barn, and bull barn, which were destroyed by fire on October 11, 1913, were during the past fiscal year reconstructed, under the direction of yourself. The plans were prepared by this Division, and the actual construction carried on under our immediate supervision. The completion of these buildings has permitted of the inception of much experimental work. Some of the more important features of the new barns are described in the body of this report, and many phases of the work being conducted in these buildings are also discussed therein.

During the past fiscal year another assistant was appointed for this Division. Mr. G. W. Muir was named for the position of Second Assistant to the Dominion Animal Husbandman.

For help in preparing and compiling a large portion of the data contained in the text of the Central Experimental Farm report, I am indebted to Mr. G. B. Rothwell, First Assistant, and also to Mr. G. W. Muir, Second Assistant. The conducting of work and reporting results of such work on the branch Farms and Stations have been in the hands of the Superintendents of those Farms and Stations.

I regret to state that, owing to the pressure of work along other lines, Mr. D. D. Gray, farm foreman, who for some years has so efficiently conducted the various operations with swine, has found it necessary to sever his connection with this Division in this regard. During the past fiscal year this work has been taken over by the First Assistant, Mr. G. B. Rothwell. To both of these men, and also to the swine herdsman, Mr. Fred Reade, special credit is due for the very efficient manner in which the various operations were conducted, and careful and accurate records kept.

The work of keeping breeding and sales records for the Central Experimental Farm, and also the registration work for all Dominion Experimental Farms, has been most efficiently performed by Mr. G. B. Rothwell.

Mr. Jos. Meilleur, dairyman at the Central Farm, has done most excellent work and kept careful records in his department.

To Mr. Robt. Cunningham, herdsman at the Central Farm, I am indebted for constant and efficient care of stock and for interest and assistance in new work, as well as the satisfactory performance of the routine work in connection with all classes of cattle.

Mr. O. Johnson has shown both efficiency and diligence in his office work, which includes a heavy correspondence and the keeping of records.

During the past year another permanent appointment has been made to the staff of this Division, Mr. R. R. McKibbin being appointed to the position of stenographer. His work has been most satisfactory.

Attention is drawn to the fact that all feeding experimental work is conducted in co-operation with the Division of Chemistry. Readers are referred to the report of the Dominion Chemist, Dr. Frank T. Shutt, in which are contained the analyses of all foodstuffs being fed experimentally.

During the year I have attended many meetings, including the series of meetings on "Patriotism and Production." I have judged at various exhibitions and have studied live-stock conditions in various districts in the several provinces, in addition to my regular duties on the Central Experimental Farm. I have also visited each of the branch Farms and Stations where live stock work is being conducted, both in the eastern and western provinces, and, in co-operation with the superintendents of these Farms and Stations, under the direction of yourself, have started many new lines of live stock experimental work.

I have the honour to be, sir,
Your obedient servant,

E. S. ARCHIBALD,
Dominion Animal Husbandman.

OTTAWA.

BEEF CATTLE

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN,

E. S. ARCHIBALD, B.A., B.S.A.

As reported previously, no breeding herds of beef cattle have been maintained on the Central Experimental Farm since the removal, in 1911, of the Shorthorn herd from Ottawa to the branch Farm at Brandon, Man., this owing to lack of pasturage, forage crops, and buildings necessary for such work.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

BEEF CATTLE.

The very high prices paid for all grades of fat cattle for the Newfoundland market during the summer of 1914 left very few desirable feeders in the country in the autumn.

An average bunch of steers was purchased on October 15, and allowed to run on rape and pasturage for one month. When the rape was pastured off close, they were given ensilage corn in the field. On November 5, when all danger from flies was over, the steers were dehorned. This operation did not check any of them, and the wounds healed very quickly.

The meal mixture was made up as follows: Oats (ground), 86 pounds; barley (ground), 14 pounds. Bran was fed as required to keep the digestive tract in a healthy, normal condition. The amount fed was slightly above the total amount of ground grain.

FOOD VALUES.

The bran cost $26 per ton; the grain was valued at $26 per ton; roots were valued at $2 per ton; hay, mixed (clover and timothy) at $7 per ton.

The test started on November 17, and the twelve steers were sold separately at auction March 31, 1915. The following is a detailed statement on the different lots fed:—

Lot I.

The four steers in this lot were grades that showed a little beef blood, and when finished were classed as good butchers' cattle.

Number of steers in lot		4
First weight, gross	Lb.	3,595
First weight, average	"	898·7
Finished weight, gross	"	4,480
Finished weight, average	"	1,120
Total gain in 135 days	"	885
Average gain per steer	"	221
Daily gain per steer	"	1·6
Daily gain per lot	"	6·5
Gross cost of feed	$	115 67
Cost of one pound gain	Cts.	13·1
Value of beef at beginning—3,595 pounds at 5¼ cents	$	188 74
Total cost to produce beef	"	304 41
Selling price, at 7¾ cents per pound	"	347 20
Profit	"	42 79
Profit per steer	"	10 70
Average valuation of steer at start	"	47 18
Average value price at finish	"	86 80
Average increase in value	"	39 62
Average cost of feed per steer	"	28 92
Amount of meal eaten by lot—Bran, 2,933 pounds, crushed grain, 2,879 pounds	Lb.	5,812
Amount of roots eaten by lot	"	26,532
Amount of hay eaten	"	3,882

Lot II.

The four steers in the second lot were more uniform in weight and quieter in disposition than either of the other lots. These steers were medium butchers' cattle when sold.

Number of steers in lot		4
First weight, gross	Lb.	3,285
First weight, average	"	821
Finished weight, gross	"	4,260
Finished weight, average	"	1,065
Total gain in 135 days	"	975
Average gain per steer	"	244
Daily gain per steer	"	1·8
Daily gain per lot	"	7·2
Gross cost of feed	$	109 66
Cost of one pound gain	Cts.	11·2
Value of beef at beginning—3,285 pounds at 5⅛ cents	$	168 36
Total cost to produce beef	"	278 02
Selling price, at 7½ cents per pound	"	319 50
Profit	"	41 48
Profit per steer	"	10 37
Average value of steer at start	"	42 09
Average value price at finish	"	79 87
Average increase in value	"	37 78
Average cost of feed per steer	"	27 41
Amount of meal eaten by lot—Bran, 2,778 pounds, crushed grain, 2,729 pounds	Lb.	5,507
Amount of roots eaten by lot	"	25,236
Amount of hay eaten	"	3,668

Lot III.

The four steers in this lot were lighter when the test was commenced. They were dairy steers and, though fat, they sold, on an average, at seven-eights cents per pound less than lot I, and five-eighths cents less than lot II.

Number of steers in lot		4
First weight, gross	Lb.	3,045
First weight, average	"	761
Finished weight, gross	"	3,830
Finished weight, average	"	957
Total gain in 135 days	"	785
Average gain per steer	"	196
Daily gain per steer	"	1·45
Daily gain per lot	"	5·8
Gross cost of feed	$	100 93
Cost of one pound gain	Cts.	12·8
Value of beef at beginning—3,045 pounds at 5 cents	$	152 25
Total cost to produce beef	"	253 18
Selling price, at 6⅞ cents per pound	"	263 33
Profit	"	10 15
Profit per steer	"	2 54
Average valuation of steer at start	"	38 06
Average value price at finish	"	65 83
Average increase in value	"	27 77
Average cost of feed per steer	"	25 23
Amount of meal eaten by lot—Bran, 2,635 pounds, crushed grain, 2,467 pounds	Lb.	5,102
Amount of roots eaten by lot	"	22,417
Amount of hay eaten	"	3,476

METHOD OF WORK.

Feeding.

The preliminary feeding period with rape and corn put the steers in condition and gave them a splendid start for the pen feeding which followed. The cost per steer for the month ending November 16 was estimated at $2.01; this was added to the

original cost. The steers were fed in groups of four each, in box stalls. The roots were pulped and the meal mixed with them and fed in two feeds each day, morning and evening. The hay was of good quality. A light feed was given at noon, and the balance at night. The amount of hay eaten gradually lessened. Water was supplied as required. Any food that was not eaten up readily by a lot was removed, as some of the steers showed a tendency to gorge themselves if the others were satisfied before the feed was all eaten.

Deductions.

The ordinary steer of the country can be fed at a good profit if the feeding period is not more than five months. Many grade steers of dairy blood that have been going to the factory as "canners" or for bologna can be fed with food grown on the average farm, for a short period, at a satisfactory profit.

CHARLOTTETOWN.

EXPERIMENTAL FARM, NAPPAN, N. S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

BEEF CATTLE EXPERIMENT, WINTER 1914-15.

Twenty-four steers were purchased locally during October and November, 1914, costing, on an average, 6¼ cents. This, for the Maritime Provinces, was an exceptionally high price, but beef of all kinds, during this period, was the highest it has been for some years. The very poorest class of feeders brought, during October and November, from 4½ to 5½ cents. The better class of stock was extremely hard to get at from 6 to 6½ cents, but, during the first part of December, the market began to take a turn for the worse, with the result that only a fair price was offered for a few good steers at Christmas time. Very little change took place until the latter part of April. Even then only an occasional good offer was made for first-class butcher steers. Nevertheless, hides gradually advanced in price, reaching a maximum of 18 cents the first of March, while the average run brought 17 cents per pound, but shortly dropped to 13 cents. In fact the beef market has run quite contrary to all predictions made by stockmen last fall, but there is evidence that exceptionally good prices will be offered during the latter part of May and June.

All steers purchased were well-bred Shorthorns. Twelve were in such condition that they could be classed as good butchers. The remainder were somewhat thinner, and could be classed as good stockers.

The twenty-four were divided into two main lots, namely, twelve good butchers and twelve good stockers. These in turn were divided into subjects for feeding, as follows:—

Lot 1.—Six steers, good butchers.
Lot 2.—Six steers, good stockers.
Lot 3.—Six steers, good butchers.
Lot 4.—Six steers, good stockers.

These were fed as follows: Lots 1 and 2 were fed 50 per cent more roots and meal than lots 3 and 4, respectively. Half of lots 1, 2, 3 and 4 received, in addition to their regular ration, 2 pounds molasses per steer per day.

All steers were weighed and dehorned on the 14th day of November. Three weeks later, on the 5th of December, they were again weighed and the lot found to have gained about 1,000 pounds, or 41 pounds per steer, showing they had felt the effect of dehorning but slightly. All did nicely excepting one steer which had the misfortune to strike its head, causing it to bleed. Considerable trouble was experienced in preventing too great a loss of blood, consequently he lost much in weight.

It will be noted that this experiment is a duplication of the one carried on during 1913-14.

The following tables give the results obtained:—

STEER FEEDING EXPERIMENTS AT NAPPAN, 1914-15.

COMPARISON of Lots 1 and 3, good Butchers.

—		Lot 1. "Heavy Fed"	Lot 3. "Light Fed"
Total live weight of steers, December 14, 1914	lb.	7,510	6,705
Total live weight of steers, April 5, 1915	"	8,885	8,125
Increase to April 5, 1915	"	1,375	1,420
Lot 1—			
Original weight of 6 steers, 7,510 pounds at 6¼ cts.	$	469·38	....
Weight at finish of 6 steers, 8,885 pounds at 8¼ cts.	"	733·01	....
Lot 3—			
Original weight of 6 steers, 6,705 pounds at 6¼ cts.	"	....	419·06
Weight at finish of 6 steers, 8,125 pounds at 8¼ cts.	"	....	670·31
Gross profit	"	263·63	251·25
Amount of hay consumed	lb.	10,080	10,080
Amount of meal consumed	"	3,780	2,520
Amount of roots consumed	"	37,800	25,200
Amount of molasses consumed	gal.	43·5	43·5
Cost of feed for lot, 112 days	$	143·52	112·03
Net profit	"	120·11	139·22
Daily rate of gain per steer	lb.	2·044	2·112
Cost of 1 pound gain	cts.	10·44	7·88
Cost of feed per day per steer	"	21·32	16·66
Profit per steer	$	20·02	23·21

COMPARISON of Lots 2 and 4, good Stockers.

—		Lot 2. "Heavy Fed"	Lot 4. "Light Fed"
Total live weight of steers, December 14, 1914	lb.	6,450	5,540
Total live weight of steers, April 5, 1915	"	7,865	6,725
Increase to April 5, 1915	"	1,415	1,185
Lot 2—			
Original weight of 6 steers, 6,450 pounds at 6¼ cts.	$	403·13	....
Weight at finish of 6 steers, 7,865 pounds at 8¼ cts.	"	648·86	....
Lot 4—			
Original weight of 6 steers, 5,540 pounds at 6¼ cts.	"	....	346·25
Weight at finish of 6 steers, 6,725 pounds at 8¼ cts.	"	....	554·81
Gross profit	"	245·73	208·56
Amount of hay consumed	lb.	10,080	10,080
Amount of meal consumed	"	3,780	2,520
Amount of roots consumed	"	37,800	25,200
Amount of molasses consumed	gal.	43·5	43·5
Cost of feed for lot, 112 days	$	143·52	112·02
Net profit	"	102·21	96·54
Daily rate of gain per steer	lb.	2·103	1·763
Cost of 1 pound gain	cts.	10·14	9·45
Cost of feed per day per steer	"	21·32	16·66
Profit per steer	$	17·04	16·09

NAPPAN.

COMPARISON of Sub-lot 1, good Butchers, Heavy fed.

—		Molasses.	No Molasses.
Total live weight of steers, December 14, 1914	lb.	3,555	3,955
Total live weight of steers, April 5, 1915	"	4,285	4,600
Increase to April 5, 1915	"	730	645
Molasses—			
Original weight of 3 steers, 3,555 pounds at 6¼ cts	$	222·19	.....
Weight at finish of 3 steers, 4,285 pounds at 8¼ cts	"	353·51	.....
No Molasses—			
Original weight of 3 steers, 3,955 pounds at 6¼ cts	"	.....	247·19
Weight at finish of 3 steers, 4,600 pounds at 8¼ cts	"	.....	379·50
Gross profit	"	131·32	132·30
Amount of hay consumed	lb.	5,040	5,040
Amount of meal consumed	"	1,890	1,890
Amount of roots consumed	"	18,900	18,900
Amount of molasses consumed	gal.	43·5	.....
Cost of feed for lot, 112 days	$	76·11	67·41
Net profit	"	55·21	64·90
Daily rate of gain per steer	lb.	2·17	1·92
Cost of 1 pound gain	cts.	10·42	10·45
Cost of feed per day per steer	"	22·65	20·06
Profit per steer	$	18·40	21·63

COMPARISON of Sub-lot 2, good Stockers, Light fed.

—		Molasses.	No Molasses.
Total live weight of steers, December 14, 1914	lb.	3,245	3,205
Total live weight of steers, April 5, 1915	"	3,965	3,900
Increase to April 5, 1915	"	720	695
Molasses—			
Original weight of 3 steers, 3,245 pounds at 6¼ cts.	$	202·81	.....
Weight at finish of 3 steers, 3,965 pounds at 8¼ cts	"	327·11	.....
No Molasses—			
Original weight of 3 steers, 3,205 pounds at 6¼ cts.	"	.....	200·31
Weight at finish of 3 steers, 3,900 pounds at 8¼ cts.	"	.....	321·75
Gross profit	"	124·30	121·44
Amount of hay consumed	lb.	5,040	5,040
Amount of meal consumed	"	1,890	1,890
Amount of roots consumed	"	18,900	18,900
Amount of molasses consumed	gal.	43·5	.....
Cost of feed for lot, 112 days	$	76·11	67·41
Net profit	"	48·19	54·03
Daily rate of gain per steer	lb.	2·142	2·068
Cost of 1 pound gain	cts.	10·57	9·69
Cost per day per steer	"	22·65	20·06
Profit per steer	$	16·06	18·01

NAPPAN.

COMPARISON of Sub-lot 3, good Butchers, Light fed.

—		Molasses.	No Molasses.
Total live weight of steers, December 14, 1914	Lb.	3,205	3,500
Total live weight of steers, April 5, 1915	"	3,920	4,205
Increase to April 5, 1915	"	715	705
Molasses—			
Original weight of 3 steers, 3,205 pounds at $6\frac{1}{4}$ cts	$	200·31	....
Weight at finish of 3 steers, 3,920 pounds at $8\frac{1}{4}$ cts	"	323·40	....
No Molasses—			
Original weight of 3 steers, 3,500 pounds at $6\frac{1}{4}$ cts	"	....	218,75
Weight at finish of 3 steers, 4,205 pounds at $8\frac{1}{4}$ cts	"	....	346·91
Gross profit	"	123·09	128·16
Amount of hay consumed	lb.	5,040	5,040
Amount of meal consumed	"	1,260	1,260
Amount of roots consumed	"	12,600	12,600
Amount of molasses consumed	gal.	43·5	....
Cost of feed for lot, 112 days	$	60·36	51·66
Net profit	"	62·73	76·50
Daily rate of gain per steer	lb.	2·127	2·098
Cost of 1 pound gain	cts.	8·44	7·32
Cost of feed per day per steer	"	17·96	15·37
Profit per steer	$	20·91	25·50

COMPARISON of Sub-lot 4, good Butchers, Light fed.

—		Molasses.	No Molasses.
Total live weight of steers, December 14, 1914	lb.	2,625	2,915
Total live weight of steers, April 5, 1915	"	3,140	3,480
Increase to April 5, 1915	"	515	565
Molasses—			
Original weight of 3 steers, 2,625 pounds at $6\frac{1}{4}$ cts	$	164·06	....
Weight at finish of 3 steers, 3,140 pounds at $8\frac{1}{4}$ cts	"	259·05	....
No Molasses—			
Original weight of 3 steers, 2,915 pounds at $6\frac{1}{4}$ cts	"	....	182·19
Weight at finish of 3 steers, 3,480 pounds at $8\frac{1}{4}$ cts	"	....	287·10
Gross profit	"	94·99	104·91
Amount of hay consumed	lb.	5,040	5,040
Amount of meal consumed	"	1,260	1,260
Amount of roots consumed	"	12,600	12,600
Amount of molasses consumed	gal.	43·5	....
Cost of feed for lot, 112 days	$	60·36	51·66
Net profit	"	34·63	53·25
Daily rate of gain per steer	lb.	1·532	1·681
Cost of 1 pound gain	cts.	11·72	9·14
Cost of feed per day per steer	"	17·96	15·37
Profit per steer	$	11·54	17·75

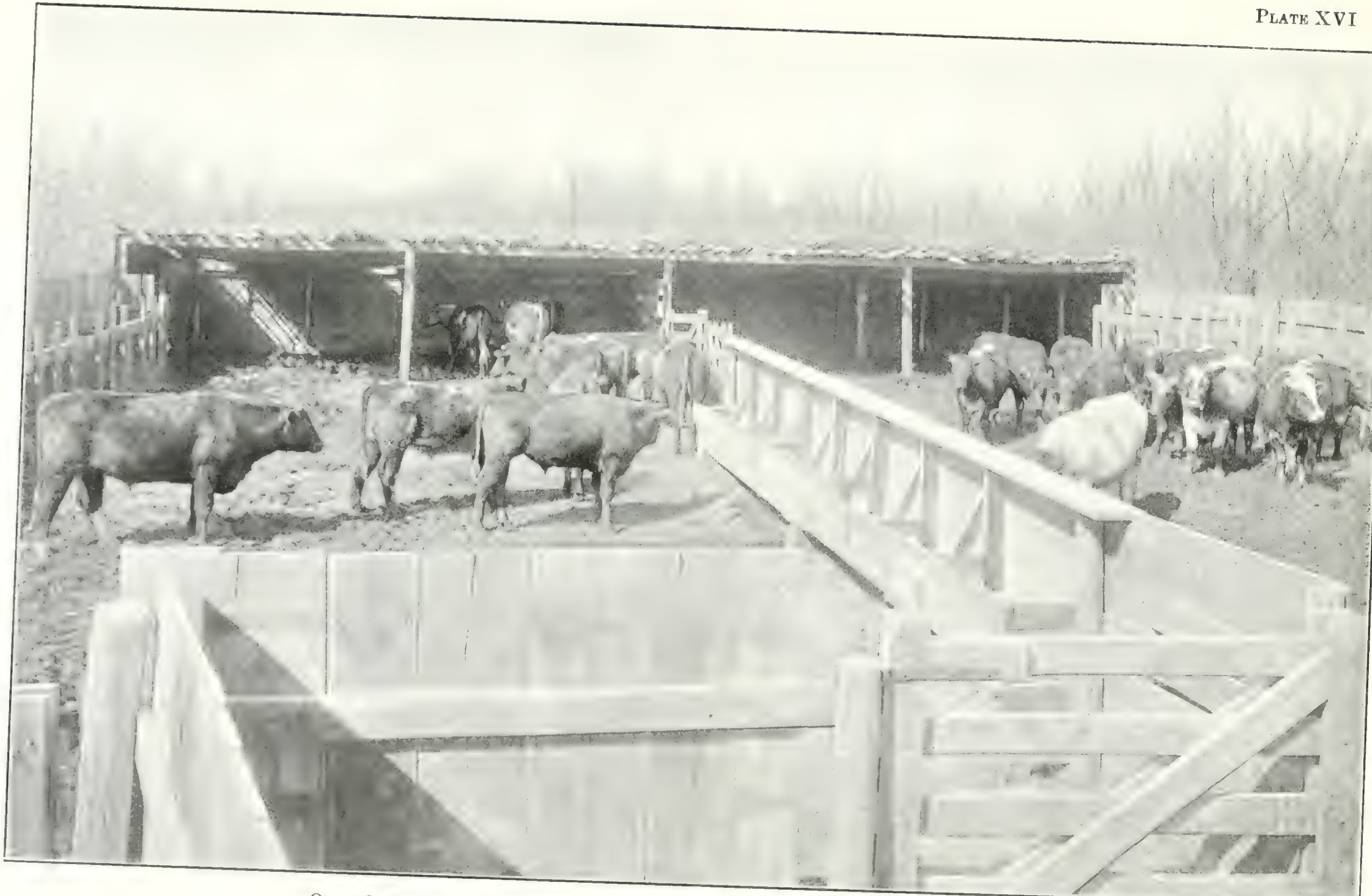
Method of work.—The steers were weighed three consecutive mornings, starting December 14, 1914, and weighed at one-week intervals (Monday morning) until the end of the feeding period, being weighed at a reasonable hour after the morning's meal, and before they were watered. Individual weights were kept. All were dehorned November 14, 1914.

NAPPAN.

Steers fed at Experimental Farm, Nappan, N.S., 1914-15.

Steers fed 1914-15. Experimental Station, Fredericton, N.B.

Experimental Station, Lennoxville, P.Q. Steers in feeding experiment. Loose vs. tied, 1914-15. Loose fed lot which made an average gain of 287 lbs. in 137 days against those tied 209 lbs.



Open shed and corral for out-door steer-feeding. Experimental Farm, Brandon, Man.

Group of Steers wintered outside. Experimental Farm, Indian Head, Sask.

Steer feeding Trials, 1914-15, Experimental Farm, Lacombe. Steers fed in the corral mode, the most economical gains showing a profit after paying for feed of $7.90 per head.

FEEDING.

1. Feeding period was from December 14, 1914, to April 5, 1915.

2. From December 5 to 14 was their preparatory feeding period, in which they were given roots, hay, and meal, gradually working up to a normal ration.

3. See table for period of feeding.

4. They received one feed of good English hay and one feed of good Broadleaf hay per day. Both were of excellent quality.

5. Roots consisted mostly of turnips and were weighed daily on barn scales.

6. The meal ration consisted of the following mixture: 200 pounds oats and barley (equal parts by weight); 400 pounds bran; 100 pounds cotton-seed; 100 pounds oil-cake.

The prices of feed were: Meal ration, $1.50 per hundredweight; roots, $2 per ton; hay, $8 per ton; and molasses, 20 cents per gallon.

Note the meal ration was 20 cents dearer per hundredweight this year than that fed last season.

See table as to amounts for respective periods of four weeks each.

RATION for Steers, 1914-15.

Lot.	Row.	No. of Steers	Ration per steer per day.											
			Dec. 14, 1914 to Jan. 11, 1915			Jan. 11 to Feb. 8			Feb. 8 to Mar. 8			Mar. 8 to April 5.		
			Roots.	Meal.	Molasses.	Roots.	Meal.	Molasses.	Roots.	Meal.	Molasses.	Roots.	Meal.	Molasses.
			Lb.	Lb.	3 steers. Lb.	Lb.	Lb.	3 steers. Lb.	Lb.	Lb.	3 steers. Lb.	Lb.	Lb.	3 steers. Lb.
1	1	3	60	2 to 3	1	60	3 to 4½	2	60	4½ to 6	2	45	6 to 9	2
2	1	6	60	2 to 3	1	60	3 to 4½	2	60	4½ to 6	2	45	6 to 9	2
3	2	6	40	1 to 2	1	40	2 to 3	2	40	3 to 4	2	30	5 to 6	2
4	3	6	40	1 to 2	1	40	2 to 3	2	40	3 to 4	2	30	5 to 6	2

Hay: 15 pounds per day per steer.

NAPPAN.

OBJECTS OF EXPERIMENT.

1. To show the result of feeding 50 per cent more roots and meal to heavy-weight steers.

2. To show the result of feeding 50 per cent more roots and meal to light-weight steers.

3. To show the profit in feeding the medium and heavy-weight steers.

4. To show the value of molasses in finishing beef.

DATA FROM EXPERIMENT.

While in general principles these results agree fairly well with those of 1913-14, there are, nevertheless, certain phases which do not coincide. This goes to show that definite conclusions cannot be drawn from one or even three years' experiments in feeding steers, due to such influences as the difference in the individuality of the animals, the buying and selling prices, and uniform fleshing.

Notwithstanding these drawbacks, there are a few interesting as well as valuable things to be noted. In the heavy-fed lots a greater increase in weight over the light-fed lots would be expected. In the stockers this held true, but not so in the good butchers. This may be explained by the fact that two of the good butcher steers, heavy-fed, were very fat when put in, hence very little gain was made by them. The greatest profits, therefore, were realized from the heavy-fed stockers and light-fed good butchers.

In every case except one, where molasses was added to the meal ration there was a decided increase in the total gain, but the increase was hardly sufficient to compensate for the high cost of molasses. The one exception may be explained by the fact that steer No. 3 in lot 4 was the one that bled so badly, hence his weight at the beginning was very much reduced, but later he made very rapid gains. This would tend to make the total increase for the lot fed no molasses greater than for those receiving molasses. Thus it is noted, even though a greater increase is obtained, molasses cannot be profitably fed, more especially when given in addition to a full meal ration.

One thing that must appeal to all interested in beef feeding is the fact that good profits can be realized over and above the cost of feed, when judicious buying and feeding have been practised. Purchase well-bred steers, care for them as they should be cared for, finish them as they should be finished for the market, and they will command a price that ensures a profit.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. S. BLAIR.

STEER-FEEDING EXPERIMENT.

Twenty-four grade Shorthorn steers were purchased in November and put on a feeding test of four months, beginning December 1, 1914, and ending March 31, 1915. Sixteen of these were dehorned and allowed to run loose in pens, and eight were tied to stanchions.

Owing to the high price of beef during the summer, all the best 3-year-old steers had been picked up, and steers of this age of good quality could not be found. The steers purchased were, with few exceptions, light and not of the best conformation for beefing. Four of the steers tied were not fed molasses. In calculating the profits on the tied lot, however, each of the eight steers has been charged for an equal portion of the molasses consumed by the four. The quantity of molasses consumed by lot 3 was the same as that consumed by lots 1 and 2, otherwise the steers were all fed alike.

FEED.

Turnips were fed the first two months at the rate of 60 pounds per day, and corn ensilage the last two months at the rate of 50 pounds per day. Ten pounds of hay was fed at the beginning and lessened to 5 pounds as the grain ration was increased, or an average of 8·65 pounds per day for the feeding period.

The meal mixture was made up of and cost as follows:—

400 pounds	bran at $1.27 per cwt.	$ 5 08
300 "	cotton-seed at $1.85 per cwt.	5 55
100 "	crushed oats at $1.50 per cwt.	1 50
100 "	middlings at $1.65 per cwt.	1 65
100 "	corn meal at $1.75 per cwt.	1 75

Or $31.06 per ton, or 1·55 cent per pound.

The turnips and corn ensilage were each valued at $2 per ton and hay at $12 per ton.

The cost of feed per steer for the period of 121 days was as follows:—

Turnips, 3,662 pounds at $2 per ton	$ 3 65
Corn ensilage, 2,712 pounds at $2 per ton	2 71
Hay, 1,047 pounds at $12 per ton	6 28
Grain, 728 pounds at 1·55 cent per pound	11 28
Molasses, 27½ pounds at 1·8 cent per pound	49
Total	$24 42
Cost per day for feeding period	20·18 cents.

Lot 1—Best Steers, Loose.

Number of steers in lot		8
First weight, gross, December 1, 1914	Lb.	7,490
" average	"	936
Finished weight, gross, March 31, 1915	"	9,831
" average	"	1,229
Number of days in test	Days.	121
Total gain in 121 days	Lb.	2,341
Average gain per steer	"	292
Daily gain per steer	"	2·41
Daily gain per lot	"	19·34
Gross cost of feed for period	$	195 34
Cost of one pound gain per lot	Cts.	8·34
Cost, original, December 1, 1914, at $5.75 per cwt	$	430 67
Total cost, March 31, 1915	"	626 03
Selling price, March 31, 1915, at $7 per cwt	"	688 17
Profit per lot	"	62 14
Profit per steer	"	7 76
Average valuation per steer to start, December 1, 1914	"	53 84

Lot 1—Best Steers, Loose.—Concluded.

Average sale price per steer at finish March 31, 1915	$	86 02
Average increase in value	"	32 18
Average cost of feed per steer	"	24 42
Amount of meal eaten	Lb.	728
Amount of roots eaten	"	2,662
Amount of ensilage eaten	"	2,712
Amount of hay eaten	"	1,047
Amount of molasses eaten	"	27·5

Lot 2—Medium Steers, Loose.

Number of steers in lot		8
First weight, gross, December 1, 1914	Lb.	6,455
First weight, average	"	807
Finished weight, gross, March 31, 1915	"	8,234
Finished weight, average	"	1,029
Number of days in test	Days.	121
Total gain in 121 days	Lb.	1,779
Average gain per steer	"	222
Daily gain per steer	"	1·83
Daily gain per lot	"	14·70
Gross cost of feed for period	$	195 36
Cost of 1 pound gain per lot	Cts.	10·98
Cost, original, December 1, 1914, at $5.75 per cwt	$	371 17
Total cost March 31, 1915	"	566 53
Selling price March 31, 1915, at $7 per cwt	"	576 88
Profit per lot	"	9 85
Profit per steer	"	1 23
Average valuation per steer to start, December 1, 1914	"	46 39
Average sale price per steer at finish, March 31, 1915	"	72 04
Average increase in value	"	25 65
Average cost of feed per steer	"	24 42
Amount of meal eaten	Lb.	728
Amount of roots eaten	"	3,662
Amount of ensilage eaten	"	2,712
Amount of hay eaten	"	1,047
Amount of molasses eaten	"	27·5

Lot 3—Medium Steers, tied.

Number of steers in lot		8
First weight, gross, December 1, 1914	Lb.	6,530
First weight, average	"	816
Finished weight, gross, March 31, 1915	"	8,127
Finished weight, average	"	1,016
Number of days in test	Days.	121
Total gain in 121 days	Lb.	1,597
Average gain per steer	"	199
Daily gain per steer	"	1·64
Daily gain per lot	"	13·19
Gross cost of feed for period	$	195 36
Cost of 1 pound gain	Cts.	12·23
Cost, original, December 1, 1914, at $5.75 per cwt	$	375 47
Total cost March 31, 1915	"	570 83
Selling price March 31, 1915, at $7 per cwt	"	568 89
Loss per lot	"	1 94
Loss per steer	Cts.	24
Average valuation per steer to start December 1, 1914	$	46 93
Average sale price per steer at finish March 31, 1915	"	71 11
Average increase in value	"	24 18
Average cost of feed per steer	"	24 42
Amount of meal eaten	Lb.	728
Amount of roots eaten	"	3,662
Amount of ensilage eaten	"	2,712
Amount of hay eaten	"	1,047
Amount of molasses eaten	"	27·5

FEEDING MOLASSES.

In order to test out the value of molasses for feed eight steers as uniform as could be got were divided into two lots. These two lots were fed alike except that the steers in lot 4 received ·93 pound of molasses each per day, after February 1, in addition to the other feeds.

KENTVILLE.

It will be noticed that the two lots made practically the same gain per day from December 1 to February 1. It will be seen also that the lot receiving molasses from February 1 to March 31 made better gains during this period than the lot not receiving molasses, and that the increase was sufficient to pay for the additional outlay for molasses and give a slight profit besides. The gain in favour of the molasses-fed lot was $3.66.

Lot 4.—With Molasses.

Number of steers in lot		4
First weight, gross, December 1, 1914	Lb.	3,410
" average	"	852.5
Weight February 1	"	3,875
Number of days fed to February 1	"	62
Average gain per day to February 1	"	7.5
Finished weight, gross, March 31, 1915	"	4,237
Number of days fed from February 1 to March 31	Days.	59
Average gain per day from February 1 to March 31	Lb.	6.13
Finished weight, average	"	1,059.25
Number of days in test	Days	121
Total gain in 121 days	Lb.	827
Average gain per steer	"	206.75
Daily gain per steer	"	1.70
Daily gain per lot	"	6.83
Gross cost of feed for period	$	99 68
Cost of 1 pound gain per lot	Cts.	12.05
Cost, original, December 1, 1914, at $5.75 per cwt	$	196 07
Total cost March 31, 1915	"	295 75
Selling price March 31, 1915, at $7 per cwt	"	296 59
Profit per lot	Cts.	84
Profit per steer	"	21
Average valuation per steer to start, December 1, 1914	$	49 01
Average sale price per steer at finish March 31, 1915	"	74 14
Average increase in value	"	25 13
Average cost of feed per steer	"	24 92
Amount of meal eaten	Lb.	728
" roots eaten	"	3,662
" ensilage eaten	"	2,712
" hay eaten	"	1,047
" molasses eaten	"	55

Lot 5.—Without Molasses.

Number of steers in lot		4
First weight, gross, December 1, 1914	Lb.	3,120
" average	"	780
Weight, February 1, 1915	"	3,595
Number of days fed to February 1, 1915	Days.	62
Average gain per day to February 1	Lb.	7.66
Finished weight, gross, March 31, 1915	"	3,890
Number of days fed from February 1 to March 31	Days	59
Average gain per day from February 1 to March 31	Lb.	5
Finished weight average	"	972.5
Number of days in test	Days.	121
Total gain in 121 days	Lb.	770
Average gain per steer	"	192.5
Daily gain per steer	"	1.59
Daily gain per lot	"	6.36
Gross cost of feed for period	$	95 72
Cost of 1 pound gain	Cts.	12.4
Cost, original, December 1, 1914, at $5.75 per cwt	$	179 40
Total cost, March 31, 1915	"	275 12
Selling price, March 31, 1915, at $7 per cwt	"	272 30
Loss per lot	"	2 82
Loss per steer	"	70
Average valuation per steer to start, December 1, 1914	"	44 85
Average sale price per steer at finish, March 31, 1915	"	68 08
Average increase in value	"	23 23
Average cost of feed per steer	"	23 93
Amount of meal eaten	Lb.	728
" roots eaten	"	3,662
" ensilage eaten	"	2,712
" hay eaten	"	1,047

KENTVILLE.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

STEER FEEDING—SPRING OF 1914.

At the end of the last fiscal year, March 31, 1914, there were in the stables here thirty-six steers that were put in to feed on the 8th of January. They were a rough lot, mostly grade Holsteins, but the only cattle available in the district at that time.

They were bought and fed to turn some of the rough crops of the Farm into manure, and no experimental work was attempted with them. On account of their type and the purpose for which they were used they were not grain-fed as heavily as would ordinarily have been the case.

Until the 1st of April their feed consisted of:—

Hay, 28 tons at $8 per ton		$ 224 00
Turnips, 2,000 bushels at 8 cents per bushel		160 00
Bran, 4,500 pounds at $18 per ton		40 50
From the 1st of April to the 27th May they were fed—		
Hay, 16 tons 1,353 pounds at $8 per ton		133 42
Corn ensilage, 44 tons 920 pounds at $2.50 per ton		111 15
Bran, 4 tons 892 pounds at $18 per ton		80 03
Oats, 2 tons 446 pounds at $33 per ton		73 36
Cotton-seed meal, 1,638 pounds at $40 per ton		32 76
Oil cake, 1,638 pounds at $36.20 per ton		29 65
Molasses, 150 gallons at 20 cents per gallon		30 00
		$ 914 87
Cost of cattle	$ 2,000 00	
Less 3 heifers	180 00	
		1,820 00
		$ 2,734 87
24 head sold at 6¾ cents per pound, weight after shrinkage, 25,065 pounds	$ 1,691 88	
12 head sold at 5⅞ cents, 9,865 pounds	579 56	
		2,271 44
Loss		$ 463 43

The loss on this transaction was due: first, to the poor type of cattle; and second, to the fact that when they were bought the winter was partially over and beef then was considerably higher than when they were sold.

STEER FEEDING—WINTER 1914-15.

In October, 1914, thirty-three steers and three heifers were bought to feed for beef. They were run on a bush pasture till the 7th of November, getting a daily feed of white turnips while there. They were then stabled and white turnips not topped were fed to them liberally with 12 pounds of hay per day until November 15, when 3 pounds daily of a grain ration composed of four parts bran, two parts cottonseed meal, and one part nutted oil cake were given. The steers were divided into three classes: eleven choice, eleven fair, and eleven dairy type. The choice lot were all Shorthorn grade, the fair were part Shorthorn and some of evident Ayrshire breeding, while the dairy type were Holstein grades and scrubs.

Object of Experiment.—To test the feeding gains to be made by choice and fair type beef steers and dairy type steers:—

——		Choice.	Fair.	Dairy.	Total.
Number of animals in each group		11	10	10	31
First weight, gross, November 15	lb.	11,045	8,660	8,580	28,285
First weight, average, November 15	"	1,004	866	858	912 4
Finished weight, gross, April 1	"	13,555	10,815	10,230	34,600
" average, April 1	"	1,232·2	1,081·5	1,023	1,116·1
Number of days in experiment	days	135	135	135	135
Total gain for period	lb.	2,510	2,155	1,650	6,315
Average gain per animal	"	228·1	215·5	165	203 71
" daily gain for group)	"	18·59	15·95	12·22	46·7
" " per animal	"	1·69	1·59	1·22	1·5
Quantity meal eaten by group for period	"	9,856	8,960	8,960	27,776
" roughage, for period	"	91,520	83,200	83,200	257,920
Total cost of feed per group	$	349 25	317 50	317 50	984 25
Cost of feed per head for period	$	31 75	31 75	31 75	31 75
" per day	cts.	23½	23½	23½	23½
Cost to produce 1 pound gain	"	14	15	19	15⅓
Original cost of animals per group	$	702 76	535 55	498 99	1,737 00
" plus cost of feed	$	1,052 01	853 05	816 49	2,721 25
Selling price at $7.50 per 100 pounds	$	1,016 63	811 13	....	1,827 76
Selling price at $7 per 100 pounds	$	....	....	716 10	716 10
Net loss per group	$	35 38	41 92	100 39	177 39
" animal (average)	$	3 22	4 19	10 03	5 72
Nutritive ratio of total ration	1: 5·57				
" meal ration	1: 2·05				
Dry matter required to produce 1 pound gain	lb.	14·94	15·81	20·65	16·77
Digestible matter required to produce 1 pound gain	"	9·72	10·24	13·44	10·44
Meal required to produce 1 pound gain	"	3·92	4 15	5·43	4·39
Roughage required to produce 1 pound gain	"	36·47	38 6	50·42	40·84

FREDERICTON.

Object of Experiment.—To test relative gains made by feeding steers when tied and loose.

Feed given.—Hay, turnips, corn, ensilage, bran, cottonseed meal, oilcake.

——		Tied.	Loose.	Total.
Number of animals in each group		19	12	31
First weight, gross, November 15	lb.	17,795	10,490	28,285
" average, November 15	"	936·6	874·2	912·4
Finished weight, April 1	"	21,460	13,140	34,600
" average, April 1	"	1,129·4	1,095	1,116·1
Number of days in experiment	days	135	135	135
Total gain for period	lb.	3,665	2,650	6,315
Average gain per animal	"	192·90	220·83	203·71
" daily gain for group	"	27·1	19·5	46·7
" " per animal	"	1·4	1·6	1·5
Quantity meal eaten by group for period	"	17,024	10,752	27,776
" roughage eaten by group for period	"	158,080	99,840	257,920
Total cost of feed per group	$	603 25	381 00	984 25
Cost of feed per head for period	$	31 75	31 75	31 75
" " per day	cts.	23·5	23·5	23·5
" to produce 1 pound gain	cts.	16·	14·	15·5
Original cost of animals per group	$	1,115 30	622 00	1,737 00
" plus cost of feed	$	1,718 55	1,003 00	2,721 25
Selling price at $7.50 per 100 pounds	$	1,124 63	703 13	1,827 76
" $7. per 100 pounds	$	452 55	263 55	716 10
Net loss per group	$	141 37	36 32	177 39
" animal (average)	$	7 44	3 02	5 72
Nutritive ratio of total ration	1: 5·57			
" meal ration	1: 2·05			
Dry matter required to produce 1 pound gain	lb.	17·71	15·43	16·77
Digestible matter required to produce 1 pound gain	"	11·53	10·89	10·44
Meal required to produce 1 pound gain	"	4·64	4·05	4·39
Roughage required to produce 1 pound gain	"	43·13	37·68	40·84

FINANCIAL STATEMENT.

EXPENDITURES.

7 steers, 7,330 pounds at $6.75 per 100 pounds	$ 494 77
19 steers, 17,055 pounds at $6.15 per 100 pounds	1,048 88
3 steers, 2,300 pounds at $5 per 100 pounds	115 00
4 steers, 3,450 pounds at $6 per 100 pounds	207 00
Hay, 25 tons 1,840 pounds at $10 per ton	250 92
Turnips, 2,464 bushels at 8 cents per bushel	197 12
Ensilage, 45 tons 200 pounds at $3 per ton	135 30
Bran, 8 tons 384 pounds at $24.83 per ton	203 40
Cotton-seed meal, 4 tons 192 pounds at $34.50 per ton	141 31
Oilcake, 2 tons 96 pounds at $38.50 per ton	78 85
	$ 2,872 55

RETURNS.

By sale, 6 steers, 6,065 pounds at 7 cents	424 55
" 25 steers, 28,550 pounds at 7½ cents	2,141 25
" 2 unthrifty steers, killed, inspected, and passed	88 28
Balance, loss on steers	218 47
	$ 2,872 55

The high price of feeding cattle in October, and high cost of feed and partial loss of two steers all contributed to this adverse balance.

FREDERICTON.

EXPERIMENTAL STATION, LENNOXVILLE, QUE.

REPORT OF THE SUPERINTENDENT, J. A. McCLARY.

BEEF CATTLE.

Seventy-nine stockers were purchased on the Toronto market in the month of July, for feeding purposes at this Station. When freight and expenses were added, the average cost of these steers was $61.55 per head, or 7½ cents per pound.

These steers were turned out in the rough pasture lands, which, up to this time, had had no stock on them, leaving the grass, which was not of a very good quality, very dry and hard. As a result, the cattle made very little gain while at pasture. These cattle were brought into the barns on October 28, and the following experiments were carried on:—

Loose *versus* tied feeding;
Light silage and heavy grain *versus* heavy silage and light grain.

We had the the misfortune to lose two of these steers one being shot in pasture by a stray bullet and the other going down in slaughter.

The high price of beef when these were bought, the misfortune of losing two, the high cost of feed, and the slump in the beef market in the spring of 1915 caused this lot of cattle to be kept at an average loss of $6.11 per head.

Loose *versus* Tied.

——		Lot No. 1. "Loose"	Lot No. 2. "Tied"
Number of steers in lot		6	6
First weight, gross, November 7, 1914	lb.	5,322	5,440
First weight, average	"	887	907
Finished weight, gross, March 30, 1915	"	7,048	6,695
Finished weight, average	"	1,175	1,116
Total gain in 143 days	"	1,726	1,255
Average gain per steer	"	288	209
Daily gain per steer	"	2·01	1·46
Cost of feed for period	"	142·08	142·08
Actual value at beginning of experiment, at 6 cts per pound	$	319·32	326·40
Total cost, including cost of feed	$	461·40	468·40
Selling price, March 30, 1915, at 7½ cents per pound	$	528·60	502·12
Profit per lot	$	67·20	33·64
Profit per steer		15·20	5·60
Average value per steer at start	$	43·22	54·40
Average cost of feed per steer	$	23·68	23·68
Average selling price per steer	$	88·10	83·70
Average profit per steer	$	11·20	5·60

Amount of feed consumed per steer:—

			Per Ton.
140½	pounds	cotton-seed meal, at	$32 50
140½	"	oil-cake meal, at	33 00
313½	"	bran, at	24 00
148	"	barley, at	34 00
5,718	"	silage, at	3 00
848	"	hay, at	10 00

Light Silage and heavy grain *versus* Heavy Silage and light grain.

—		Lot 1.	Lot 2.
Number of steers in lot		4	4
First weight gross, November 26, 1914	lb.	3,859	3,942
First weight, average	"	965	985
Finished weight, gross, March 30, 1915	"	4,452	4,625
Finished weight, average	"	1,113	1,156
Total gain in 124 days	"	593	683
Average gain per steer	"	148	170
Daily gain per steer	"	1·193	1·371
Actual value of steers at commencement of experiment at 6 cents per pound	$	31·54	236·52
Total cost of feed	$	99·24	81·48
Total cost, including cost of feed	$	330·78	318·00
Selling price, March 30, 1915, at 7½ cents per pound	$	333·90	346·87
Profit	$	3·12	28·87
Average value of steer at start	$	57·88	59·13
Average cost of feed per steer	$	24·81	20·37
Average selling price per steer	$	83·47	86·71
Average profit per steer	$	0·78	7·21

Amount of feed consumed per steer, lot No. 1—

		Per Ton.
217 7/12	pounds of cotton-seed meal, at	$32 50
217 7/12	" oil-cake meal, at	33 00
435 1/6	" bran, at	24 00
228 2/3	" barley, at	34 00
3,010	" silage, at	3 00
812	" hay, at	10 00

Amount of feed consumed per steer, lot No. 2—

		Per Ton.
114 1/3	pounds of cotton-seed meal, at	$32 50
114[illegible]	" oil-cake meal, at	33 00
228 2/3	" bran, at	24 00
123 2/3	" barley, at	34 00
5,208	" silage, at	3 00
798	" hay, at	10 00

Summary of Steer Feeding.

Cost of 79 steers	$ 4,862 52
Average cost per head	61 55
Cost of feed for 79 steers	1,945 25
Average cost of feed per head	24 62
Total cost of 79 steers, including cost of feed	6,807 77
Average total cost per head, including cost of feed	86 17
Selling price of 79 steers	6,324 82
Average selling price per head	80 06
Total loss	482 95
Average loss per head	6 11

Lennoxville.

In reckoning cost of feed for these cattle, values were figured as follows:—

	Per Ton.
Hay	$10 00
Silage	3 00
Bran	24 00
Cotton-seed meal	32 50
Oil-cake meal	33 00
Barley meal	34 00

These cattle were fed, at the commencement, a ration of 50 pounds of silage, 5 pounds of hay, and 3 pounds of meal, composed of two parts of bran, one part of cotton-seed meal, and one part of oil-cake meal, which grain ration was gradually increased through the feeding season and at time of sale they were receiving 6½ pounds of meal daily, composed of three parts of bran, two parts of oil-cake meal, two parts of cotton-seed meal, and one part of barley meal. The hay was increased to 7 pounds and silage decreased to 25 pounds.

LENNOXVILLE.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

STEER FEEDING EXPERIMENTS.

All the breeding cattle on this Farm are handled as a dairy herd, and are reported in the Dairy section of the report, even though some of them are pure-bred Shorthorns of beef breeding. The only beef cattle, fed and handled as such, are the feeding steers purchased each fall for experimental feeding during the winter.

CORN SILAGE VERSUS DRY CORN FODDER.

The experiment in steer-feeding which was tried during the winter of 1913-14, was a test of corn silage *versus* dry corn fodder as part of the ration. A carload of fairly good steers was purchased in Winnipeg stock yards at 6 cents per pound, in November, 1913. Freight, commission, and shrinkage brought the cost up to $6.40 per cwt. when they were weighed in at the Experimental Farm. They were divided into two very nearly equal lots. Both lots were fed during the winter in the stable in large box-stalls. They were dehorned at the beginning of the experiment. One steer in lot 2 bled badly when dehorned, but recovered afterwards. One lot was fed corn silage, and the other lot received dry corn fodder which had been cured in stooks and kept in the field until required. Both kinds of corn were analysed, and they were fed in such quantities that the same amount of the actual solid matter of the corn was eaten by each steer. Except for the corn, the feed given to each lot was identical. Both lots got cut straw mixed with the corn, and toward the end of the test this was supplemented with some alfalfa hay. They were fed oat and barley chop, commencing with 2 pounds per steer daily and gradually increasing to 14 pounds per steer daily; the quantity used for a longer time than any other was 8 pounds per steer daily.

The experiment was finished on May 15, 1914. The steers were sold at $7.60 per cwt., farm weights, 5 per cent off for shrinkage. It will be observed that the margin between buying and selling prices is only $1.20 per cwt., or even less when the allowance for shrinkage is considered. This is too small a margin for six months' feeding, and the profits are small even though the steers made exceptionally good gains. No allowance is made for labour; when this is considered the dry corn fodder steers were handled at a loss, while the other lot just about paid their way.

The results in tabular form are as follows:—

STEER FEEDING EXPERIMENT 1913-14.

——		Lot 1. Fed Corn Fodder.	Lot 2. Fed Ensilage.
Number of steers in lot		10	10
First weight, gross, November 15, 1913	lb.	10,265	10,240
First weight, average	"	1,026½	1,024
Finished weight, gross, May 15, 1914	"	12,865	13,645
Finished weight, average	"	1,286½	1,364½
Total gain in 181 days	"	2,600	3,405
Average gain per steer	"	260	340½
Average daily gain per steer	"	1·44	1·88
First cost of steers, at $6.40 per cwt	$	656·96	655·36
Total cost of feed	$	260·66	262·25
Total cost	$	917·62	917·61
Receipts from sale, at $7.60 per cwt., 5 per cent off for shrinkage	$	928·87	985·18
Profit	$	11·25	67·57
Average cost per steer	$	65·70	65·54
Average cost of feed per steer	$	26·06	26·22
Average selling price per steer	$	92·89	98·52
Average profit per steer	$	1·13	6·76
Average cost of 1 pound gain	cts.	10·02	7·70
Returns realized for 100 pounds oats and barley	$	1·07	1·45
Amounts of feed used—			
Oat and barley chop, at $20 per ton	lb.	14,960	14,960
Straw, at $2 per ton	"	12,305	13,444
Alfalfa, at $12 per ton	"	2,464	2,464
Corn silage, at $3 per ton	"	....	56,290
Dry corn fodder, at $6.75 per ton	"	24,885	....

While the financial results are not very satisfactory, the results on the question of the best method of storing corn fodder are quite clear and form strong evidence in favour of building silos. The steers on silage made an average gain of 340½ pounds in the six months, or 1·88 pound per day. The steers on dry corn fodder gained 260 pounds each on the average, or 1·44 pounds per day. While they were all sold at the same rate, the several buyers who inspected them all agreed that those which had received the silage were really worth from ¼ to ½ cent more per pound than the others.

EXPERIMENT FOR 1914-15.

Two carloads of steers were purchased in November, 1914, for experimental work during the present winter. They are of much the same type as the ones used in the previous experiment and cost the same price, 6 cents per pound in Winnipeg stock yards. They have been divided into four lots, and experiments both in regard to housing and feeding are being conducted. Two lots are being fed in large box stalls in the stable, and two lots are fed in a corral outdoors with only an open shed for shelter. Of the two indoor lots, one receives mixed hay for roughage, and the other corn ensilage and straw. Of the two outdoor lots, one receives mixed hay for roughage, and the other alfalfa hay. All four lots are fed exactly the same grain ration. Up to March 31, all four lots have done fairly well, and no decisive results are apparent.

BRANDON.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE ASSISTANT TO THE SUPERINTENDENT, K. MacBEAN, B.S.A.

BEEF CATTLE

As the work with the breeding herd of Shorthorns is the development of the dual-purpose cow, it follows that our interest with beef cattle is principally the feeding of steers for market. Although the herd possesses several cows that are of beef conformation, the aim is gradually to eliminate such, retaining only those that conform more to the requirements of the milking Shorthorn.

STEER FEEDING EXPERIMENTS.

In the steer-feeding work, several very interesting and profitable experiments were carried on during the past season.

On October 8 last, four steers belonging to a local dealer were placed in our stables to be fed for the Christmas market. They were accepted at 6½ cents per pound, and were to be re-delivered at 7½ cents per pound. This margin, though narrow, gave profitable returns for the labour and feeding, due to the satisfactory gains which the steers put on.

Results of Experiment.

	Weight on Oct. 8.	Weight when re-delivered.	Gain.	Dates when re-delivered.
	Lb.	Lb.	Lb.	
No. 1	1,215	1,320	105	Dec. 15
No. 2	1,180	1,350	170	Dec. 28
No. 3	1,050	1,200	150	Dec. 28
No. 4	1,035	1,100	65	Dec. 1

Original value, 4,480 pounds at 6½ cents per pound		$ 291 20
Out-going value, 4,970 pounds at 7½ cents per pound		372 75
Increase in value	$ 81 55	
Interest on $291.20 at 8 per cent per annum	4 55	
Amount due the Farm for feed and labour		$ 77 00
Cost of feed—		
Roots, 10,847 pounds at $2 per ton	$ 10 85	
Barley, 984 pounds at $24 per ton	11 80	
Oats, 984 pounds at $24 per ton	11 80	
Peas, 492 pounds at $28 per ton	6 90	
Hay, 1,625 pounds at $10 per ton	8 15	
Total cost of feed		$ 49 50
Profit over cost of feed		$ 27 50

This leaves a balance of $27.50 in favour of the Farm and, as the value of the manure is considered a recompense for labour involved, the foregoing steers made fair returns even on a 1-cent margin.

From the same firm six steers were taken over on December 1, under the same conditions as the former except that a margin of 1¼ cents per pound was to be allowed, while the steers were to be fed for Easter. These were valued at the outset at 6 cents per pound and returned at 7¼ cents per pound.

Results.

Value on December 1, 6,080 pounds at 6 cents per pound..	$ 364 80	
Value on March 30, 7,505 pounds at 7¼ cents per pound..	544 10	
Increase in value..	$ 179 30	
Interest on $364.80 for 118 days at 8 per cent.. ..	9 45	
Amount due the Farm for feed and labour..		$ 169 85
Cost of feed (same materials as fed the former four steers, and valued at same price)..		$ 126 30
Profit over cost of feed..		$ 43 55

This sum of $43.55 is considered a fair profit.

Experience showed the above system of feeding to be quite profitable even with a 1-cent margin.

STEERS PURCHASED IN THE FALL OF 1914.

Forty steers, of which twenty-eight were 2-year-olds and the remainder 3-year-olds, were purchased locally at a price of $6.15 per hundred pounds for the 2-year-olds, and $6.50 per hundred pounds for the 3-year-olds. These were put on their different feeding tests on December 1, the experiments concluding on May 10—a period of 160 days.

Results show a larger profit this season than last, because of the wide margin between the buying and selling prices. The steers were all sold for $8.50 per hundred pounds, thus giving a spread of 2 cents per pound between the buying and selling prices of the 3-year-olds and a spread of 2⅓ cents per pound in the case of the 2-year-olds; the latter outrunning the former, as was our experience last year also. This year's gains, however, were not so satisfactory as those of last year, the average daily gain per head being 1·5 pounds as contrasted with that of 2·3 pounds while, further, the highest gain per day made last year was 3 pounds as compared with 2·7 pounds this season.

The steers fed a year ago had the advantage of much better feed, whereas this winter's lot were unfortunate in getting inferior rations, as to quality of straw, hay, and ensilage. The steers fed this season were of a superior type to those under test last year and, though the gains were not so good, yet they gave higher profits by reason of the very satisfactory spread between the buying and selling prices.

Although one animal, then, may make much more economical gains than another, the latter may yield the greater profit, as results depend so much on the margin between the buying and selling prices.

INDIAN HEAD.

The following outline describes the allocation of the steers in groups and lots, together with the rations fed the different animals.

PLAN OF EXPERIMENT.

Group.	Lot 1. 2-year-olds.	Lot 2. 3-year-olds.	Ration.
	No. of steers.	No. of steers.	
1	6 (outside)..........	6 (outside)..	Oat straw, prairie hay, and meal composed of equal parts of barley and oats.
2	6 (outside—loose)...	2 (inside—loose)....	Oat straw, prairie hay, and meal composed of equal parts of barley and oats.
3	4 (inside—tied).....	....	Oat straw, prairie hay, and meal composed of equal parts of barley and oats.
4	4 (inside—tied).....	....	Oat straw, oat sheaves, and same meal.
5	4 (inside—tied).....	4 (inside—tied)....	Oat straw, prairie hay, silage, and same meal.
6	4 (inside—tied).....	....	Oat straw, prairie hay, silage, and meal composed of barley, oats, peas, bran, and oil cake when finishing.

The experiment included a comparison of 2-year-olds and 3-year-olds; steers fed inside compared with those fed outside and getting the same feed; and also a comparison between different rations.

The experienced feeder might criticize certain of the foregoing rations, but one must make use of the feeds at his disposal, and in these experiments only such feeds as could be utilized by the average farmer in the district were used. Even wheat straw, as well as oat and barley straw, was fed this winter, and it is well known how little feed value wheat straw possesses.

The following table summarizes results, while a few explanatory remarks thereon are appended:—

RESULTS of Steer-feeding Experiments.

		Group 1, Outside Loose.		Group 2, Inside Loose.		Group 3, Inside Tied	Group 4, Inside Tied	Group 5, Inside Tied		Group 6, Inside Tied
		Lot 1, 2-year-olds.	Lot 2, 3-year-olds.	Lot 1, 2-year-olds.	Lot 2, 3-year-olds.	Lot 1, 2-year-olds.	Lot 1, 2-year-olds.	Lot 1, 2-year-olds.	Lot 2, 3-year-olds.	Lot 1, 2-year-olds.
Number of steers in experiment		6	6	6	2	4	4	4	4	4
Number of days in experiment		160	160	160	160	160	160	160	160	160
Total weight at beginning of experiment	lb.	6,370	7,485	5,955	2,710	3,780	3,865	4,035	5,420	4,385
Total weight at end of experiment	"	8,005	9,270	7,670	3,315	4,685	4,790	4,905	6,235	5,225
Gain during period	"	1,635	1,785	1,715	605	905	925	870	815	840
Gain per head	"	272·5	297·5	285·8	302·5	226·25	231·25	217·5	203·75	210
Daily gain per head	"	1·7	1·8	1·78	1·89	1·41	1·44	1·3	1·27	1·3
Amount of meal eaten by lot	"	8,900	10,450	8,900	3,480	5,930	5,930	5,300	8,086	5,300
Amount of mixed hay eaten by lot	"	8,820	8,850	8,820	2,940	5,880	....	5,000	5,200	4,800
Amount of straw eaten by lot	"	4,000	4,000	4,000	1,300	2,600	2,600	1,680	2,600	1,680
Amount of ensilage eaten by lot	"	....	....	....	....	....	....	16,630	19,532	16,630
Number of oat sheaves eaten by lot		....	....	....	....	....	1,624	....	....	....
Total cost of feed	$	153·90	171·65	153·90	57·22	101·86	153·66	110·22	148·73	111·87
Cost of feed per head	$	25·65	28·60	25·65	28·61	25·46	38·41	27·55	37·18	27·96
Cost of feed per head per day	$	0·16	0·17	0·16	0·17	0·15	0·24	0·17	0·23	0·17
Cost to produce 1 pound gain	$	0·094	0·096	0·08	0·09	0·11	0·16	0·13	0·19	0·13
Original cost of steers	$	391·75	486·52	366·23	176·15	232·47	237·70	248·15	352·30	269·68
" plus cost of feed	$	545·65	658·17	520·13	233·37	334·33	391·36	358·37	501·03	381·55
Total receipts from sale	$	680·43	787·95	651·95	281·78	398·23	407·15	416·93	529·98	444·13
Net profit on lot	$	134·78	129·78	131·82	48·41	63·90	15·79	58·56	28·95	62·58
Net profit per steer	$	22·46	21·63	21·97	24·20	15·97	3·94	14·64	7·24	15·64

A glance at the table shows that the steers fed "loose" gave far better returns than those "tied." Steers fed outside gave larger profits than those similarly fed inside "tied," while those fed the same as the former two groups but inside and "loose" gave best results of all.

Until an "old-time" winter is experienced, results as to the outdoor feeding are not absolute; for though returns this year and last were most satisfactory in this regard, yet one must remember that both these winters were exceptionally mild.

With reference to the feeding "inside loose," results in favour thereof might possibly be greater still were the accommodation available in the stable suitable. These steers were fed in a closed implement shed, and were not as warm as if in the stable.

Results with those fed oat sheaves show little in favour of this ration, there being always a certain amount of waste, together with a lack of uniformity of quality in the feed.

Although variety in the ration gives usually best results, we are unfortunately unable to substantiate that fact this season with reference to those rations in which ensilage was included. The reason is that the ensilage was of very poor quality, the corn having been frozen in August, and it was fed this season, not to test the value of this roughage, but rather as a means to its disposal.

The ration in which the best meal mixture was fed was also upset by the quality of the ensilage, as results prove. Last year this ration gave best results of all, while the next was that in which ensilage was also fed, the meal mixture in same being less expensive, however.

This year's results in the steer-feeding experiments are altogether most gratifying; the total profit, after allowing for a shrinkage of 5 per cent, being $641.25 or a little over $16 per head, some steers having made as high as $24 profit.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

STEER-FEEDING EXPERIMENT.

An experiment was conducted during the winter of 1914-15 to compare the value of alfalfa as a roughage when fed alone or fed in conjunction with oat sheaves or with dry corn fodder, also a comparison of alfalfa fed alone and oat sheaves fed alone. To carry on this experiment, eighty-four steers were purchased and divided at the beginning into four lots as nearly equal in point of age, weight, and conformation as possible. They were all dehorned except lot 4. The dehorning gave them a slight setback but later they became more docile.

The four lots were fed all the roughage they would eat up clean, and had access to water at all times. There was an unusual amount of stormy weather with snow, which makes a condition that is more unfavourable for outside feeding than severe cold without the snow.

PLAN OF EXPERIMENT.

The four lots received the same amount of meal, which consisted of barley moderately finely ground. The roughage varied with each group. Group I received alfalfa; group II, alfalfa and oat sheaves; group III, oat sheaves; group IV, alfalfa and corn fodder. In lot IV the original plan was to feed three-quarter corn fodder and one-quarter alfalfa, but owing to a limited supply of corn fodder it was replaced in the early part of the experiment, to a greater or less extent, with oat sheaves. By February 23 the supply of corn fodder was exhausted, so that group IV was sold and the other three groups were fed on to about the beginning of May. The gains made were small and the profits not large owing to the relatively narrow margin between the buying and selling prices. The gain, however, was reasonably satisfactory when it is taken into consideration that the steers finished off on 7 pounds of chop per day. Owing to the high price of grain and the low prevailing prices of beef, the marketing of grain "on the hoof" did not look very alluring at the beginning of the winter. The results obtained, although not showing a very great net profit, should be encouraging to the farmers contemplating feeding alfalfa, as the test gives an indication as to what can be expected, even when conditions are unfavourable so far as prices are concerned.

STEER-feeding Experiment.

		Group I.	Group II.	Group III.	Group IV.
Number of steers in group		19	21	21	21
First weight, gross, (December 17, 1914)	lb.	21,032	23,220	23,168	22,860
First weight, average	"	1,107	1,106	1,103	1,088
Finished weight, gross, (April 26, April 30, May 3, and February 23, respectively)	"	23,106	25,930	25,500	24,952
Finished weight, average	"	1,216	1,235	1,214	1,188
Total gain for period (130, 134,137, and 68 days)	"	2,074	2,710	2,332	2,092
Average gain per steer	"	109	129	111	100
Average daily gain per steer	"	0·83	0·96	0·81	1·47
Amount of meal eaten by group	"	15,263	16,513	16,954	6,863
Amount of alfalfa hay eaten by group	"	56,638	34,845	....	17,240
Amount of oat sheaves eaten by group	"	....	35,240	58,390	6,195
Amount of corn fodder eaten by group	"	....	....	....	16,365
Amount of salt eaten by group	"	120	150	134	63
Total cost of feed	$	493 66	551 90	462 83	244 59
Cost of feed per steer	$	25 98	26 28	22 03	11 65
Cost of feed per steer per day	$	0 20	0 19	0 16	0 17
Cost to produce 1 pound gain	$	0 23	0 20	0 19	0 11
Original cost of group, including freight, etc.	$	1,243 48	1,374 37	1,374 47	1,374 47
Original cost of group plus cost of feed	$	1,737 14	1,926 27	1,837 30	1,619 06
Selling price at $7.55, $7.75, $7.75, and $6.75 per hundred pounds	$	1,744 50	2,009 57	1,976 25	1,684 26
Net profit per group	$	7 36	83 30	138 05	65 20
Net profit per steer	$	0 38	3 96	6 61	3 15

In computing the above, the prices charged were:—

	Per ton.
Alfalfa	$ 12 00
Oat sheaves	10 00
Corn fodder	5 00
Barley chop	20 00
Salt at actual cost.	

The usual practice at the Experimental Station is to take three crops of alfalfa off the irrigated land. The third cutting is apparently somewhat risky to feed to steers, unless in combination with some other roughage, because of its tendency to cause bloat or tympanitis, and the loss of one or more animals runs away with the profits in steer feeding. It would appear to be safer for the feeder who is feeding alfalfa for the first time to take some precautions and, if possible, feed along with it oat sheaves, prairie hay, possibly good green straw, or any other available roughage. Not only will more feed be consumed, but the danger of bloating will be overcome.

The steers were sold locally and the weight quoted was that obtained at the stock-yards, a distance of two miles from the Station. At the completion of the corn fodder, Group IV was sold at a profit when there was only a ¾-cent margin between the buying and selling price. The corn fodder, along with alfalfa, makes practically a balanced ration. This combined with the palatability, makes it an excellent combination.

The alfalfa and oat sheaves group made most profitable gains when fed for twice the period of group IV. This again shows the advisability of introducing a supplement to give variety and widen the nutritive ratio. The reason for the higher net returns from oat sheaves as compared with alfalfa can be explained from the fact that the oat sheaves are valued at $10 per ton and alfalfa at $12 per ton. Were both the feeds valued at the same price, alfalfa would result in not only more gains but cheaper gains.

Cost of steers, including freight		$ 5,497 49
Cost of feed		1,802 51
Scale charges		4 10
Selling price	$ 7,408 44	
Net profit		104 34
	$ 7,408 44	$ 7,408 44

LETHBRIDGE.

EXPERIMENTAL STATION, LACOMBE, ALBERTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

BEEF CATTLE.

The herd of pure-bred Aberdeen Angus cattle now numbers twenty-five head. During the year the herd has unfortunately been subjected to loss from blackleg. A peculiar feature of this attack was the fact that fully mature animals included in the regular breeding herd were not immune. Immediately after the disease was diagnosed, the entire herd was vaccinated, and no losses were sustained ten days after treatment. The vaccinations have been repeated at intervals of six months and, having taken this precaution, it is hoped that no recurrence of the disease will take place.

There are a number of promising heifer calves being reared, and as the herd bull "Elm Park Ringleader 7th" is leaving animals of strong individuality, the value of the Angus herd is constantly increasing. A number of pure-bred yearling bulls have been disposed of, at reasonable prices, during the year.

GAINS OF YOUNG CATTLE ON PASTURE.

With the object of securing information as to the gains made by yearling steers on pasture, seven head of steers which had been carried through the winter in the ordinary way, and were not in high flesh, were turned out on pasture on May 26, after having been carefully weighed. They were brought in from pasture on October 30. The cost of 1 pound of gain on pasture, with the pasture valued at $1 per head per month, is 3·72 cents for the average of this lot. Information is desired as to the average number of cattle that may be carried on pasture, both native and cultivated grasses. When information of this kind is available from figures covering a number of years' work, it will be possible to state the value of land for pasture purposes. The tables submitted herewith give further details with regard to this test:—

COST OF PASTURING SEVEN STEERS.

First gross weight, May 26, 1914	Lb.	3,940
First average weight, May 26, 1914	"	562·85
Gross weight, October 30, 1914	"	4,880
Average weight, October 30, 1914	"	697·14
Total gain on pasture (5 months)	"	940
Average gain on pasture (5 months)	"	134·29
Daily gain on pasture (5 months)	"	·88
Gain per steer per month	"	26·85
Total cost of pasture	$	35 00
Value of gain at 5 cents per pound	"	6 71
Return value for pasture per month	"	1 34
Cost per pound gain on pasture	Cents.	3·72

FEEDING FOR BEEF.

Sixty steers were fed for beef during the winter of 1914-15. They were nearly all 3-year-olds, but there were a few 2-year-old cattle in the group. The experiments were started on November 25, when the cattle were divided into groups, and feeding was commenced with the object of comparing gains made by cattle on the same feed in the barn *versus* in the corral *versus* in the bush without shelter other than the bluff itself.

There were fifty steers included in this portion of the experiment in which various forms of shelter were compared—ten in the barn and twenty each in the corral and bush. The comparison of the food value of different rough fodders was made, using ten other steers in the barn. These were check-fed against ten on prairie hay, and were divided as follows: Six on green sheaves, two on timothy hay, and two on ensilage and straw. The group of two on ensilage and straw did not show any particularly high food values for this combination of bulky fodders, but it should be explained that this group of steers was too small to ensure very reliable results, particularly when one of the individuals in the group developed a very nervous disposition when confined in the barn. For this reason the figures in this particular group are not considered very reliable; they indicate, however, the marked superiority of ensilage and straw over timothy hay.

The feeding of grain was commenced on January 1, when a mixture composed of one part of ground oats to two parts of ground barley was fed, starting at the rate of 3 pounds per head per day. This ration was gradually increased until 8 pounds per steer per day was being fed. Because of the fact that the cattle seemed to be making very good gains on this quantity of grain, and also because of the relatively high price of grain during the past winter, the amount of the grain ration was not increased beyond 8 pounds per head per day. The steers in all groups were fed a similar grain ration, both in quality and amount.

The steers were given all the salt they would eat, and those in the barn had water before them at all times. The steers in the corral were watered twice daily at a large tank outside, in which a tank heater was placed and sufficient fire kept therein to prevent ice from forming. The steers in the bush were watered through the ice at a large slough.

This test is the third of a similar nature carried on at this Station, and it is safe to draw certain conclusions with regard to the character of shelter with which feeders would be justified in providing their cattle. The results two years out of three have been decidedly in favour of feeding outside in the corral. The results during the third season rather indicated an advantage in inside feeding, though not sufficient to cover the charges that would necessarily be made against the cattle feeding inside in order to cover interest on investment in buildings, and depreciation of same. Again, at the time the cattle were weighed in 1913, when those fed inside appeared to have the advantage, the temperatures were extremely low and thus cattle outside were not drinking to the same extent as those in the barns, which had free access to water under favourable conditions, consequently the shrinkage would be greater on the cattle fed inside. In 1914, the cattle at the time they were weighed were equally well filled and the shrinkage of all groups was practically equal. Of car weights, the cattle dressed an average of 59·99 per cent.

We believe that no feeder would be justified in erecting buildings in which to carry on his feeding operations. A corral with a 6- or 7-foot close board fence to break the wind, and with a fair amount of room for the number of cattle being fed, will prove satisfactory. In addition to the close board fence and a fair amount of elbow room, the corral should be kept well bedded. If this sort of shelter is available, together with plenty of hay or green feed and a moderate amount of grain, regularly fed, with an unlimited amount of salt and water, the feeder will provide a set of conditions which will put liberal gains on any bunch of well-bred cattle.

The following table gives in detail the results of the trial concluded March 3, 1915. Since the feed fed in 1915 was purchased, the purchase price has been charged against the cattle this year. These prices are: \$5 per ton for prairie hay; 56 cents per bushel for barley; and 40 cents per bushel for oats.

When the cattle intended for feeding were shipped into Lacombe, almost one-half of the number in two cars had been dehorned previously, while the remainder still carried the ornaments that nature provides in the shape of horns. All cattle shipped

and turned into strange pastures will show shrinkage, but an experiment was undertaken to determine the effect of dehorning on the amount of shrinkage. The following figures show that the steers which were dehorned on arrival shrank 23·7 pounds per head, in one week, more than those which had been previously dehorned.

From these figures it would appear to be good business to dehorn cattle as calves by the use of caustic potash, or to dehorn as yearlings when the check will not be so great.

	Horned.	Dehorned.
	Lb.	Lb.
First weight, October 31, 1914	32,974	27,005
Average weight, October 31, 1914	1,176·6	1,174·1
Gross weight, November 7, 1914	31,325	26,195
Average weight, November 7, 1914	1,118·7	1,139·0
Total loss	1,649·0	810·0
Average loss	58·9	35·2

Steer Feeding Experiment.—Dominion Experimental Station, Lacombe, 1914-15.

		Group 1. Green feed. Inside.	Group 2. Timothy hay. Inside.	Group 3. Ensilage and straw. Inside.	Group 4. Prairie hay. Outside.	Group 5. In corral. Inside.	Group 6. In bush. Outside.
Number of steers in lot		6	2	2	10	20	20
First weight, November 25, 1914	lb.	7,100	2,370	2,475	11,700	23,278	23,625
First average weight	"	1,183	1,185	1,237	1,170	1,163	1,181
Finished weight	"	7,980	2,540	2,680	12,690	27,430	26,590
Finished average weight	"	1,330	1,270	1,340	1,269	1,371	1,329
Total gain in 97 days	"	880	170	205	990	4,152	2,965
Average daily gain per steer	"	1·51	0·87	1·055	0·99	2·14	1·52
Amount of meal eaten	"	2,598	866	866	4,060	8,660	8,660
Amount of hay eaten	"	....	3,840	8,015	29,030	58,450	66,290
Amount of green feed eaten	"	9,328	....	....	....	....	....
Amount of straw eaten	"	....	....	3,765	....	....	....
Gross cost of feed	$	77 04	29 33	25 91	120 07	247 44	267 04
Average cost of feed per steer	$	12 84	14 66	12 95	12 00	12 37	13 35
Cost of cattle	$	437 83	146 15	152 62	721 50	1,435 64	1,456 87
Average value of steers at start	$	72 97	73 07	76 31	72 15	71 78	72 84
Cost of 100 pounds gain	$	8 75	17 25	12 98	12 12	5 93	9 00
Return from cattle at $7.10, less 5 per cent. shrinkage, less half of 1 per cent. insurance	$	535 57	170 48	179 87	851 67	1,840 91	1,784 54
Average selling price per steer	$	89 26	85 24	89 93	85 16	92 05	89 23
Average increase in value	$	16 29	12 17	13 62	13 01	20 28	16 39
Profit on group	$	20 70	−5 00	1 34	10 10	157 83	60 63
Profit per head	$	3 45	−2 50	0 67	1 01	7 90	3 03

Lacombe.

DAIRY CATTLE

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN, E. S. ARCHIBALD, B.A., B.S.A.

DAIRY CATTLE.

There are in all 158 head of cattle in the barns, comprising 116 head of pure-breds and 42 head of grade milch cows and heifers. All dairy cattle are kept for experimental breeding and feeding work.

PURE-BRED BREEDING CATTLE.

Ayrshires..	30, including	13	milch cows,	12	heifers,	5	bulls.
Canadians..	22,	" 10	"	7	"	5	"
Guernseys..	23,	" 10	"	10	"	3	"
Holsteins..	25,	" 10	"	11	"	4	"
Jerseys..	16,	" 9	"	3	"	4	"

GRADE HERDS.

Grade Ayrshires..	17, including 11	milch cows.	4	heifers.	2	steers.
Grade Holsteins..	25, " 14	"	7	"	4	"

HOLSTEINS.

The Holstein herd is still headed by the splendid 2-year-old bull "King of the Ormsbys," No. 14959. The junior herd bull, "Sir Johanna Ormsby of Hickory," a yearling bull of rare individuality and exceptionally good breeding, is an excellent addition to this herd.

AYRSHIRES.

The Ayrshire herd continues to show marked improvement. This herd is now headed by the yearling bull "Burnside Masterpiece," a youngster of marked individuality and with a record, both for production and trueness to type, without an equal for his age in Canada.

GUERNSEYS.

The Guernsey herd has remained practically unchanged since last reported, except for a normal increase in numbers.

FRENCH CANADIANS.

The French-Canadian herd also remains practically unchanged. This herd is headed by the excellent 3-year-old bull "Ottawa Zouave," No. 2864. A junior herd sire "Delphis de Cap Rouge," No. 3283, is a very valuable addition.

JERSEYS.

The Jersey herd, established in the year 1911, has shown very marked improvement, especially during the past fiscal year. Two heifers, 3 and 4 years of age respectively, have made exceptionally good records, with the most ordinary care and under the most

trying circumstances. Both of these heifers freshened just previous to the loss of the buildings by fire, in October, 1913, and received the best treatment possible, but, under existing conditions, not of the kind which promised to stimulate high records. Special attention is drawn to the records of these heifers.

SALES OF BREEDING STOCK.

Again, I have to report the sales of many excellent young bulls, which have been widely distributed, at reasonable figures, amongst farmers and agricultural societies. These will undoubtedly be heard from, both as good sires and as representative examples of the breed.

SUMMER FEEDING.

The year 1914-15 has been most unsatisfactory for pasture. The spring opened with very little moisture in the ground to stimulate the pastures, and the extremely dry months of April, May, June, and the first half of July caused not only a shortage of the pasture crops but also of hay and other forage crops. The rains of the fall made fairly good late pasture, but, generally speaking, the shortage of pasture has been the most severe in the history of this Farm.

Attention is drawn to the fact that the cost of feeding dairy cattle during the past fiscal year was very much higher than it has ever been in the past. This is due to the fact that, owing to the loss of our feeds by fire, much of the roughages and the grains and meals were purchased, at high prices, on the open market. Again, the corn ensilage, which is the basis of economic dairy husbandry in this part of Canada, was largely lost or wasted, due to the destruction of the silos; hence a much greater amount of meal was necessary in order to grow the young stock and prepare the cows and heifers for their lactation periods. As great economy as possible was practised with cows in milk, but none of the young stock suffered for lack of feed.

Owing to the loss of a large part of the ensilage by fire, and due to the fact that the rest of the ensilage had to be consumed in order to make any use of the same before it spoiled, there was no reserve of this valuable feed for the month of August.

WINTER FEEDING.

The winter feeding was conducted under more favourable conditions than a year ago, as the new buildings had been completed. Unfortunately, the quantity of some of the roughages was not as great as usual, owing to the extremely dry season; and the crop of hay and roots was so much below an average year in amount, that the cattle did not have the usual supply. The great salvation of the winter feeding was the large quantity of splendid ensilage which had been stored.

The aged cattle entered the barns in the fall in fair flesh, and did very well during the winter months. The yearling heifers, on the limited pasture available, did poorly during the summer months, and entered the barn in low condition. However, during the winter, these have regained their former condition and have thrived well.

The winter ration per day for milch cows was, on the average, about as follows:—

	Pounds.
Hay..	5
Corn ensilage..	25
Roots..	10
Straw..	5
Meal..	7

The meal consisted of a mixture of 400 pounds of bran, 200 pounds of gluten feed, 200 pounds of ground corn, 100 pounds of linseed oil cake meal, and 200 pounds of cottonseed meal.

The hay produced on the Farm was variable in character, some being extra choice clover hay, and smaller quantities being low grade grass hay. The hay purchased to make up the shortage was of fairly good quality for the feeding of dairy cattle, especially one lot of alfalfa hay, which was the most economical hay fed during the winter. The corn ensilage was of splendid quality, rich in grain, and well preserved in the new silos. The roots were very short in quantity but of excellent quality. These were pulped and fed mixed with the corn ensilage and cut straw, excepting in the feeding experiments elsewhere reported.

The better facilities supplied in the new barn allowed the cutting of the straw at the time of threshing and blowing it into an upper loft, from which chutes extended to the feed room. The straw thus prepared for feeding was of excellent quality, and saved many tons of hay.

The meal was scattered on the ensilage after it was before the cattle. The hay was given uncut, after the other materials had been cleaned up.

Generally speaking, the milch cows were allowed all the roughage they would consume. As in former years, the meal was given in proportion to the milk produced, usually at the rate of 1 pound for every 4 or 4½ pounds of milk produced. This ratio between the meal and the milk was naturally varied to suit the requirements of each individual, as well as to suit the richness and palatability of the coarse forage.

Water was before the cows at all times. The salt was added to the roughage at the time of mixing. The same conveniences were also installed in the calf barn, and, although in the very cold weather the calves did not consume a great quantity of water, yet they apparently appreciated having this at their disposal.

ELEVATOR SCREENINGS FOR DAIRY CATTLE.

In the fall of 1914, at the request of the Seed Branch, an investigation was started with the grade herd to ascertain facts regarding the value of elevator by-products as a food for dairy cattle. These elevator by-products or screenings were supplied by the Seed Branch from certain Fort William elevators, and graded as follows:—

1. Pulverized complete screenings.
2. Pulverized blackseed.

ANALYSIS OF ELEVATOR SCREENINGS.

The following botanical analyses were supplied by the seed commissioner.

A composite sample of 6,000 tons of elevator screenings gave the following separations:—

37 Per cent scalpings.
7 " succotash flax.
18 " buckwheat screenings.
38 " blackseeds.

Scalpings.—65 per cent wheat; 25 per cent other grains; 3 per cent weed seeds; 7 per cent straw and chaff. Considered excellent feed—no immediate need to investigate its value.

Succotash Flax.—30 per cent flax; 40 per cent broken wheat; 15 per cent weed seeds, chiefly wild buckwheat, lamb's quarters, and wild oats; 15 per cent chaff.

Buckwheat Screenings.—58 per cent wild buckwheat; 29 per cent broken wheat, oats, and flax; 9 per cent weed seeds; 4 per cent chaff.

Blackseeds.—Before analyzing this material a separation was made of it by means of the 1/25-inch perforated zinc sieve.

The 38 per cent blackseeds was thus separated into 7 per cent which passed through the 1/25-inch sieve, and 31 per cent above it.

Of the portion passing through the 1/25-inch sieve, 22 per cent was tumbling mustard, 63 per cent dust, 10 per cent lamb's quarters, and 5 per cent other weed seeds.

Of the portion passing over the 1/25-inch screen, 53 per cent was lamb's quarters, 3 per cent wild mustard, 8 per cent other mustard, 9 per cent other weed seeds, and 27 per cent chaff.

The above mentioned work, which took the form of a series of co-related experiments, may best be outlined briefly under the following headings:—

Object of experiment.—To compare a good grain ration with elevator screenings, blackseeds, and with these two supplemented by Molasses Meal in order to increase palatability.

Plan of Experiment.—Each of the following experiments was conducted in three periods of two weeks each, the necessary calculations being made from data collected during the second week of each period. The first week allowed the cows to become accustomed to any change in ration. By averaging the results of the first and third periods a fair comparison with the intermediate period is possible.

Exp. I.—Period I—Regular meal mixture.
Period II—Regular meal mixture, 2 parts; elevator screenings, 1 part.
Period III—Regular meal mixture.

Exp. II.—Period I—Regular meal mixture.
Period II—Regular meal mixture, 2 parts; pulverized blackseed, 1 part.
Period III—Regular meal mixture.

Exp. III.—Period I—Regular meal mixture.
Period II—Regular meal mixture, 2 parts; elevator screenings, 2 parts; Caldwell's molasses meal, 2 parts.
Period III—Regular meal mixture.

Exp. IV.—Period I—Regular meal mixture.
Period II—Regular meal mixture, 4 parts; Caldwell's molasses meal, 2 parts.
Period III—Regular meal mixture.

Meal Mixture.—Bran, 4 parts; gluten feed, 2 parts; corn meal, 2 parts; oil cake, 1 part; cottonseed, 1 part.

Value of Feeds per Ton.—Hay, $7; roots and ensilage, $2; complete pulverized screenings, $10; blackseed, $4; Caldwell's molasses meal, $34.50; regular meal, 1·3 cent per pound.

Plan of Feeding.—All cows received the same quantity per cow of roughage; that is, hay, roots, and ensilage.

All cows received grain in the proportion of 1 pound grain for every 4 pounds milk produced. Where the grain ration was rendered unpalatable by the addition of the elevator by-products, causing several of the cows to refuse portions of the ration, such parts were weighed and credited to the cow.

TABLE No. 1.—Dairy Cow Feeding Experiment No. 1—Meal *versus* Meal, 2 parts; complete Pulverized Screenings, 1 part.

Feeds.		Meal — Period 1	Meal — Period 3	Meal — Average Periods 1 and 3	Meal and Screenings. — Period 2
Number of cows in test		16	16	16	16
Pounds of milk, produced by sixteen cows	lb.	2,732·5	2,088	2,410·5	2,450·5
Average milk per cow per day	"	24·4	18·7	21·5	21·9
Average per cent fat in milk	p.c.	3·9	3·95	3·93	3·95
Total pounds fat produced by sixteen cows	lb.	106·6	82·5	94·6	96·77
Average pounds fat per cow per day	"	·951	·739	·845	·864
Total meal consumed	"	1,036	1,036	1,036	936
Total hay consumed	"	672	672	672	672
Total molasses consumed	"	......	......	......	......
Total roots consumed	"	......	......	......	......
Total ensilage consumed	"	3,990	3,990	3,990	3,990
Mixture consumed per 100 pounds fat produced	"	971·8	1,255·7	1,095	967·8
Relative value for production of fat	p.c.	......	......	100	113·6
Mixture consumed per 100 pounds milk produced	lb.	37·9	49·6	43	38·2
Relative value for production of milk	p.c.	......	......	100	112·5
Findings from Experiment—					
Cost of meal mixture fed	$	13·46	13·46	13·46	9·67
Value of roughage fed	$	6·34	6·34	6·34	6·34
Total cost of feed	$	19·80	19·80	19·80	16·01
Cost to produce 100 pounds fat	$	18·57	24·00	20·93	16·55
Cost to produce 1 pound fat		·185	·24	·209	·165
Cost to produce 1 pound butter	$	·155	·20	·175	·138
Profit on 1 pound butter at 30 cents a pound	$	·145	·10	·125	·162
Cost to produce 100 pounds milk	$	·721	·95	·82	·662
Profit on 100 pounds milk at $1.70 per hundredweight	$	·979	·75	·88	1·04
Total weight of cows for period	lb.	16,089	16,792	......	16,387
Gain for period	"	....	405	......	298

That the ration fed during period II was unpalatable to a marked degree was shown by the fact that even during its second week, when the cows had become more or less accustomed to the change, over 100 pounds was removed and credited to the animals. Notwithstanding this, however, the production of milk during period II was greater than the average of production of periods I and III. Referring to the findings from the experiment, the cost of the elevator screenings ration is, on the values adopted, considerably lower than the meal ration alone. Taking into consideration the lessened amount of meal consumed, this would explain the relatively low cost of production. In this experiment, 312 pounds of screenings replaced 420 pounds of regular meal mixture, or at the valuation of $26 for the latter, the complete pulverized screenings fed as one-third of the grain ration acquired a value of $34 per ton. It must be remembered that this deduction, while correct, is made from the results of an experiment of very short duration, as will be discussed more fully.

Table No. 2.—Dairy Cow Feeding Experiment No. 2—Meal *versus* Meal, 2 parts; Pulverized Blackseeds, 1 part.

Feeds		Meal — Period 1	Meal — Period 3	Meal — Average Periods 1 and 3	Meal and Pulverized Blackseeds. — Period 2
Number of cows in test		15	15	15	15
Pounds of milk produced by fifteen cows	lb.	2,227·5	2,293·5	2,260·5	2,080
Average milk per cow per day	"	21·3	21·8	21·5	19·8
Average per cent fat in milk	p.c.	3·9	3·6	3·75	3·6
Total pounds fat produced by fifteen cows	lb.	86·8	82·5	84·8	74·9
Average pounds fat per cow per day	"	·826	·785	·807	·713
Total meal consumed	"	998	998	998	868
Total hay consumed	"	630	630	630	630
Total molasses consumed	"	......	......	......	......
Total roots consumed	"	1,260	1,260	1,260	1,260
Total ensilage consumed	"	2,240	2,240	2,240	2,240
Mixture consumed per 100 pounds fat produced	"	1,149	1,209	1,177	1,159
Relative value for production of fat	p.c.	......	......	100	101·5
Mixture consumed per 100 pounds milk, produced	lb.	44·8	43·5	44·6	41·7
Relative value for production of milk	p.c.	......	......	100	106·9
Findings from Experiment—					
Cost of meal mixture fed	$	12·97	12·97	12·97	8·10
Value of roughage fed	$	5·71	5·71	5·71	5·71
Total cost of feed	$	18·68	18·68	18·68	13·81
Cost to produce 100 pounds fat	$	21·52	22·64	22·03	18·44
Cost to produce 1 pound fat	$	·215	·226	·22	·184
Cost to produce 1 pound butter	$	·18	·189	·184	·154
Profit on 1 pound butter at 30 cents per pound	$	·12	·111	·116	·146
Cost to produce 100 pounds milk	$	·83	·81	·827	·664
Profit on 100 pounds milk at $1.70 per hundredweight	$	·87	·89	·873	1·036
Total weight of cows for period	lb.	15,670	16,390	......	16,052
Gain for period	"	......	338	......	382

The ration fed during the three periods, the results of which are given in the foregoing table, was even more unpalatable than that fed during experiment I, ground blackseeds having an extremely bitter flavour and being of a fine, dusty nature. One hundred and thirty pounds of the mixture were removed. The production during period II was considerably less than that of the average of periods I and III; nevertheless, with one-third of the meal ration valued at the rate of $4 per ton, and with the lessened amount of meal consumed, the cost of production in the case of the blackseed ration is relatively low. As will be shown in greater detail, the complete elimination of one-third of the ration might have resulted in still lower cost of production for this short space of time. Nevertheless, from the actual data given, the following figures may be deduced: 366 pounds blackseeds, 60 pounds hay, 126 pounds roots, and 224 pounds ensilage would be equivalent to 267 pounds meal mixture, for milk production. On the given valuations for regular feeds, blackseeds acquire a valuation of $16 per ton for milk production.

TABLE No. 3.—Dairy Cow Feeding Experiment No. 3—Meal *versus* Equal Parts of Meal, Complete Pulverized Screenings, and Caldwell's Molasses Meal.

Feeds		Meal — Period 1	Meal — Period 3	Meal — Average of Periods 1 and 3	Scr.-1 pt. Meal—1 pt. Mol. Meal—1 pt. — Period 2
Number of cows in test		16	16	16	16
Pounds of milk, produced by sixteen cows	lb.	2,654	2,604	2,629	2,476
Average milk per cow per day	"	23·7	23·2	23·4	22·1
Average per cent fat in milk	p.c.	3·7	3·7	3·7	3·7
Total pounds fat produced by sixteen cows	lb.	98·2	96·4	97·27	91·61
Average pounds fat per cow per day	"	·876	·848	·865	·817
Total meal consumed	"	1,092	1,092	1,092	992
Total hay consumed	"	672	672	672	672
Total molasses meal consumed	"	......	......	......	231
Total roots consumed	"	1,435	1,435	1,435	1,435
Total ensilage consumed	"	2,555	2,555	2,555	2,555
Mixture consumed per 100 pounds of fat produced	"	1,112	1,132	1,122	1,082
Relative value for production of fat	p.c.	......	......	100	1,037
Mixture consumed per 100 pounds of milk, produced	lb.	41·1	41·9	41·5	40·
Relative value for production of milk	p.c.	......	......	100	104·
Findings from Experiment—					
Cost of meal mixture fed	$	14·19	14·19	14·19	11·57
Value of roughage fed	$	6·34	6·34	6·34	6·34
Total cost of feed	$	20·53	20·53	20·53	17·91
Cost to produce 100 pounds fat	$	20·90	21·29	21·12	19·55
Cost to produce 1 pound fat	$	·20	·21	·21	·19
Cost to produce 1 pound butter	$	·16	·17	·17	·15
Profit on 1 pound butter at 30 cents per pound	$	·14	·13	·13	·15
Cost to produce 100 pounds milk	$	·769	·788	·778	·72
Profit on 100 pounds milk at $1.70 per hundredweight	$	·931	·912	·922	·98
Total weight of cows for period	lb.	17,508	18,026	......	17,749
Gain in weight	"	......	277	......	241

As will be seen, the above results do not indicate any particular increase in the palatability of the meal ration due to the addition of molasses meal. One hundred pounds of the mixture was removed from the cows and credited to them. Even with the lower production in period 2, and after having valued molasses meal at $34.50, the cost to produce with the screenings ration is appreciably lower.

Keeping in view the limitations of this test, the following deduction is possible: A mixture of equal parts of Caldwell's molasses meal and pulverized complete screenings replaced about the same quantity of the regular meal mixture for milk production, and is worth about $25 per ton.

TABLE No. 4.—Dairy Cow Feeding Experiment No. 4—Meal *versus* Meal, 4 parts; Caldwell's Molasses Meal, 1 part.

Feeds		Meal — Period 1	Meal — Period 3	Meal — Average of Periods 1 and 3	Meal-4 pts. Caldwell's Molasses Meal-1 pt. — Period 2
Number of cows in test		14	14	14	14
Pounds of mil, produced by fourteen cows	lb.	2,443	2,314	2,379	2,308
Average milk per cow per day	"	24·9	23·6	24·3	23·5
Average per cent fat in milk	p.c.	3·8	3·8	3·8	3·8
Total pounds fat produced by fourteen cows	lb.	92·83	87·93	90·40	87·70
Average pounds fat per cow per day	"	·95	·896	·93	·895
Total meal consumed	"	952	952	952	952
Total hay consumed	"	588	588	588	588
Total molasses consumed	"	......	......	......	......
Total roots consumed	"	1,260	1,260	1,260	1,260
Total ensilage consumed	"	2,240	2,240	2,240	2,240
Mixture consumed per 100 pounds fat produced	"	1,025	1,083	1,054	1,085
Relative value for production of fat	p.c.	......	......	100	97
Mixture consumed per 100 pounds milk produced	lb.	38·9	41	40	41·2
Relative value for production of milk	p.c.	......	......	100	96
Findings from Experiment—					
Cost of meal mixture fed	$	12·37	12·37	12·37	13·63
Value of roughage fed	$	5·50	5·50	5·50	5·50
Total cost of feed	$	17·87	17·87	17·87	19·13
Cost to produce 100 pounds fat	$	19·25	20·32	19·76	21·81
Cost to produce 1 pound fat	$	·192	·203	·197	·218
Cost to produce 1 pound butter	$	·161	·17	·165	·183
Profit on 1 pound butter at 30 cents per pound	$	·139	·13	·135	·117
Cost to produce 100 pounds milk	$	·731	·771	·75	·829
Profit on 100 pounds milk at $1.70 per hundredweight	$	·969	·929	·95	·871
Total weight of cows for period	lb.	15,708	15,883	......	15,613
Gain or loss in weight	"	......	(270 gain)	......	(85 loss)

The foregoing concluding table of this experiment is interesting for two reasons: first, because it corroborates results obtained previously in 1914 and already reported, to the effect that molasses meals are an expensive food and the use of same in a well-balanced and already palatable ration is doubtful; second, because of the very slight increase in production which it induced in comparison with corresponding periods in the previous three tables and out of all proportion to the increased cost.

In this experiment, 298 pounds of meal mixture is equal to 327 pounds of Caldwell's molasses meal, 20 pounds of hay, 37 pounds of roots, and 67 pounds of ensilage. At the given valuations of the regular feeds, Caldwell's molasses meal has a valuation of only about $22.50 per ton.

GENERAL CONCLUSIONS FROM FOUR EXPERIMENTS.

Lest too hasty deductions be made from the results given, there are several points to consider in the feeding of elevator screenings. Judging from these experiments, such material has a fair feeding value. Only in one experiment (experiment No. 1), however, did the by-product period show any increase over the average of the first and third periods, which in this instance was due to a heavy and rather unaccountable fall-

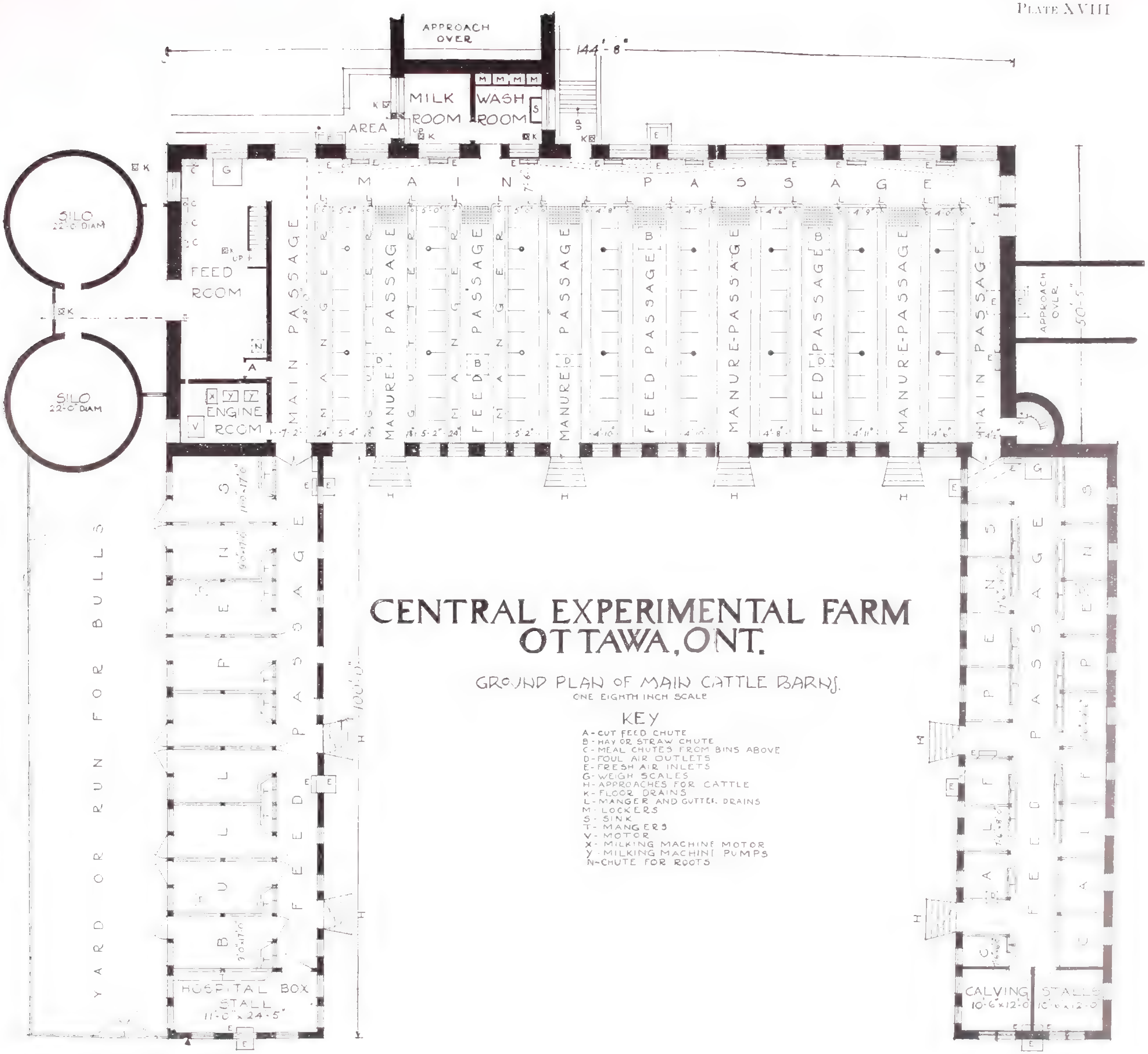
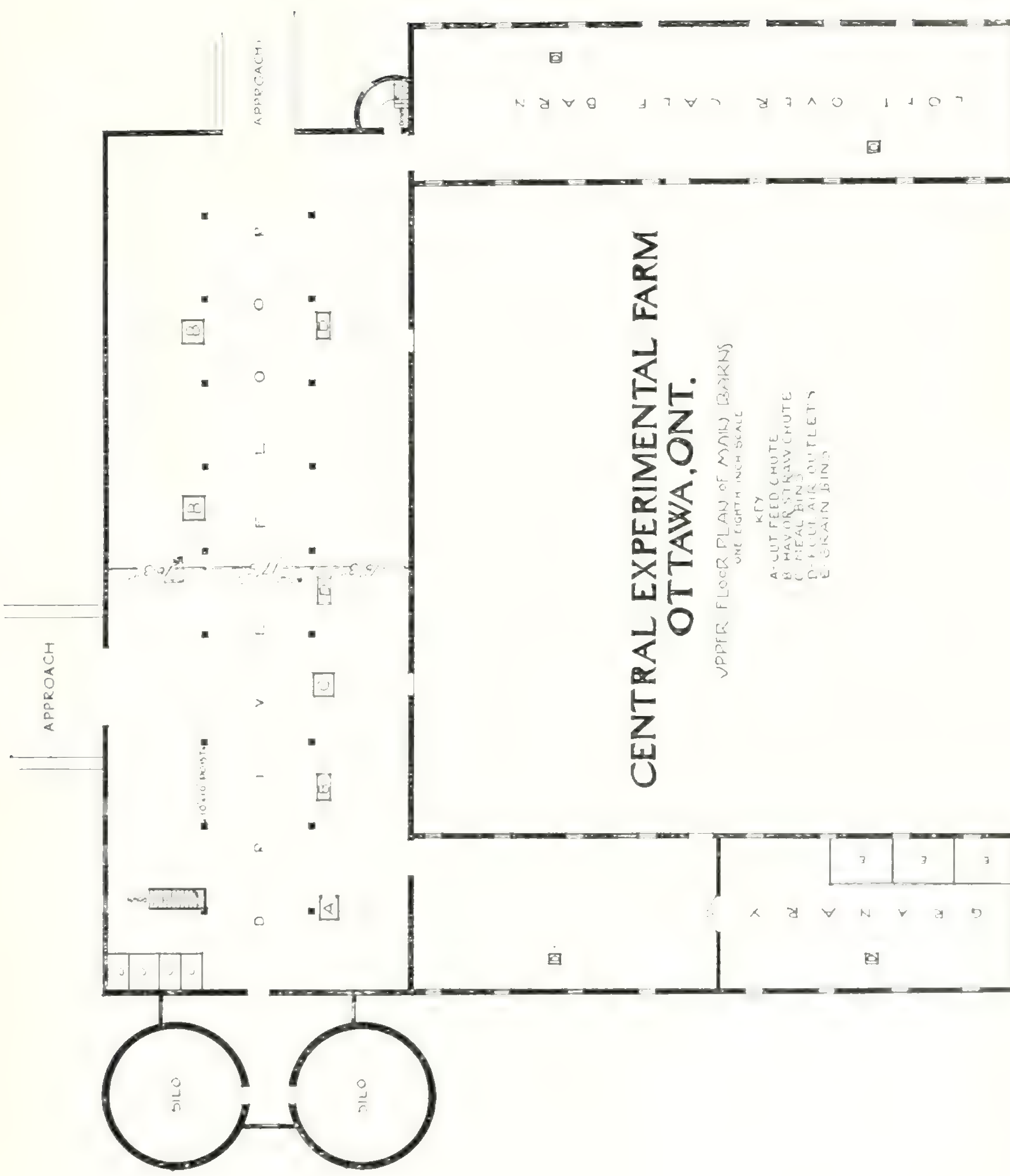
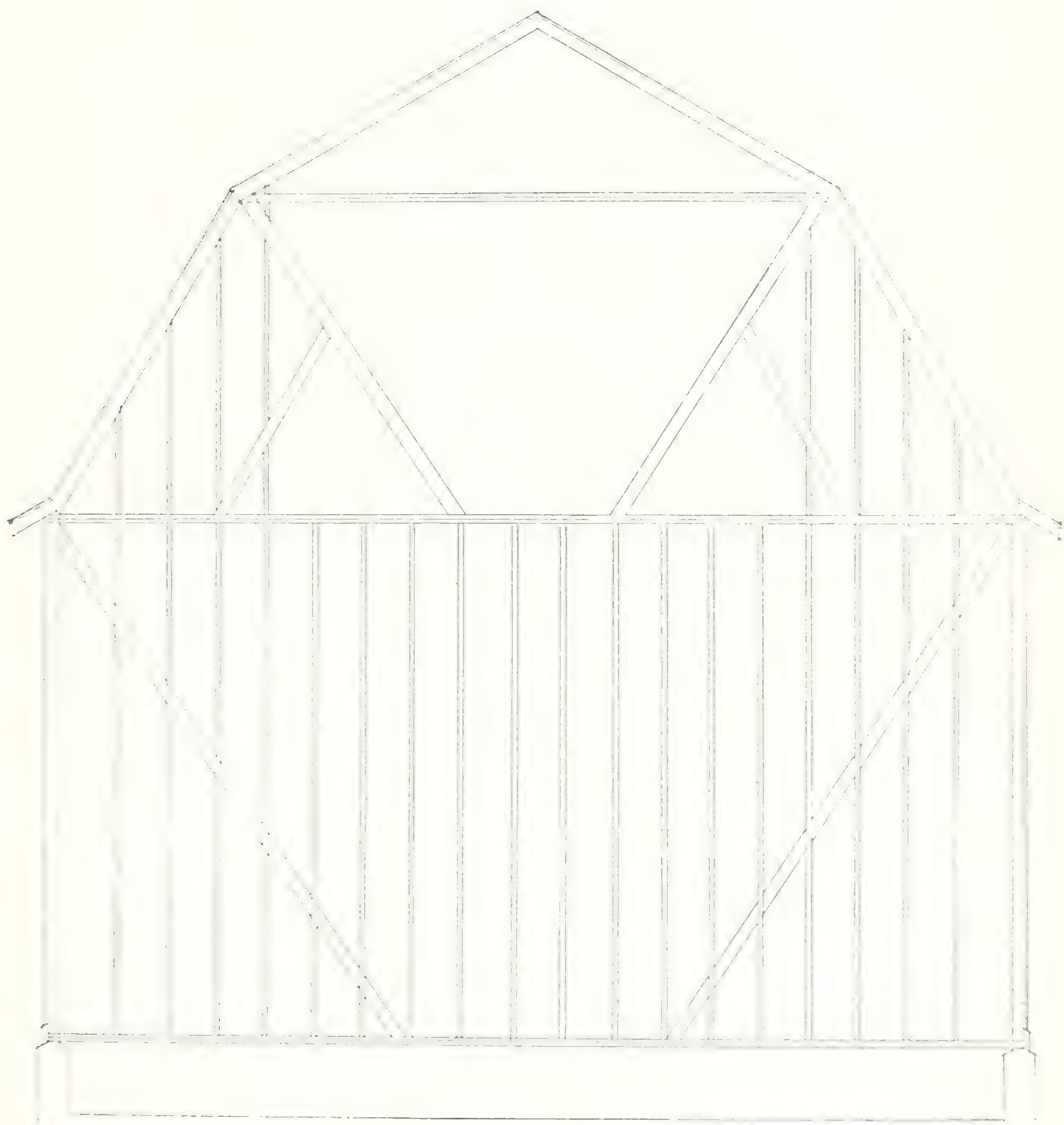

CENTRAL EXPERIMENTAL FARM
OTTAWA, ONT.
GROUND PLAN OF MAIN CATTLE BARNS.
ONE EIGHTH INCH SCALE
KEY
A - CUT FEED CHUTE
B - HAY OR STRAW CHUTE
C - MEAL CHUTES FROM BINS ABOVE
D - FOUL AIR OUTLETS
E - FRESH AIR INLETS
G - WEIGH SCALES
H - APPROACHES FOR CATTLE
K - FLOOR DRAINS
L - MANGER AND GUTTER DRAINS
M - LOCKERS
S - SINK
T - MANGERS
V - MOTOR
X - MILKING MACHINE MOTOR
Y - MILKING MACHINE PUMPS
N - CHUTE FOR ROOTS
APPROACH OVER
144'-8"
MILK ROOM
WASH ROOM
AREA
MAIN PASSAGE
SILO 22'-0" DIAM
SILO 22'-0" DIAM
FEED ROOM
ENGINE ROOM
MANGER
GUTTER
MANURE PASSAGE
FEED PASSAGE
APPROACH OVER
50'-5"
YARD OR RUN FOR BULLS
BULL PENS
FEED PASSAGE
100'-0"
HOSPITAL BOX STALL 11'-0" x 24'-5"
CALF PENS
CALVING STALLS 10'-6" x 12'-0"

PLATE XIX


CENTRAL EXPERIMENTAL FARM
OTTAWA, ONT.
UPPER FLOOR PLAN OF MAIN BARNS
ONE EIGHTH INCH SCALE
KEY
A-CUT FEED CHUTE
B-HAY OR STRAW CHUTE
C-MEAL BINS
D-FOUL AIR OUTLETS
E-GRAIN BINS
APPROACH
APPROACH
DRIVE FLOOR
LOFT OVER CALF BARN
GRANARY
SILO
SILO



FRAMING OF END BENT.

15—1916—25b½

CENTRAL EXPERIMENTAL FARM OTTAWA, ONT.

CROSS SECTION OF MAIN CATTLE BARN SHEWING METHOD OF FRAMING. ⅛ INCH SCALE.

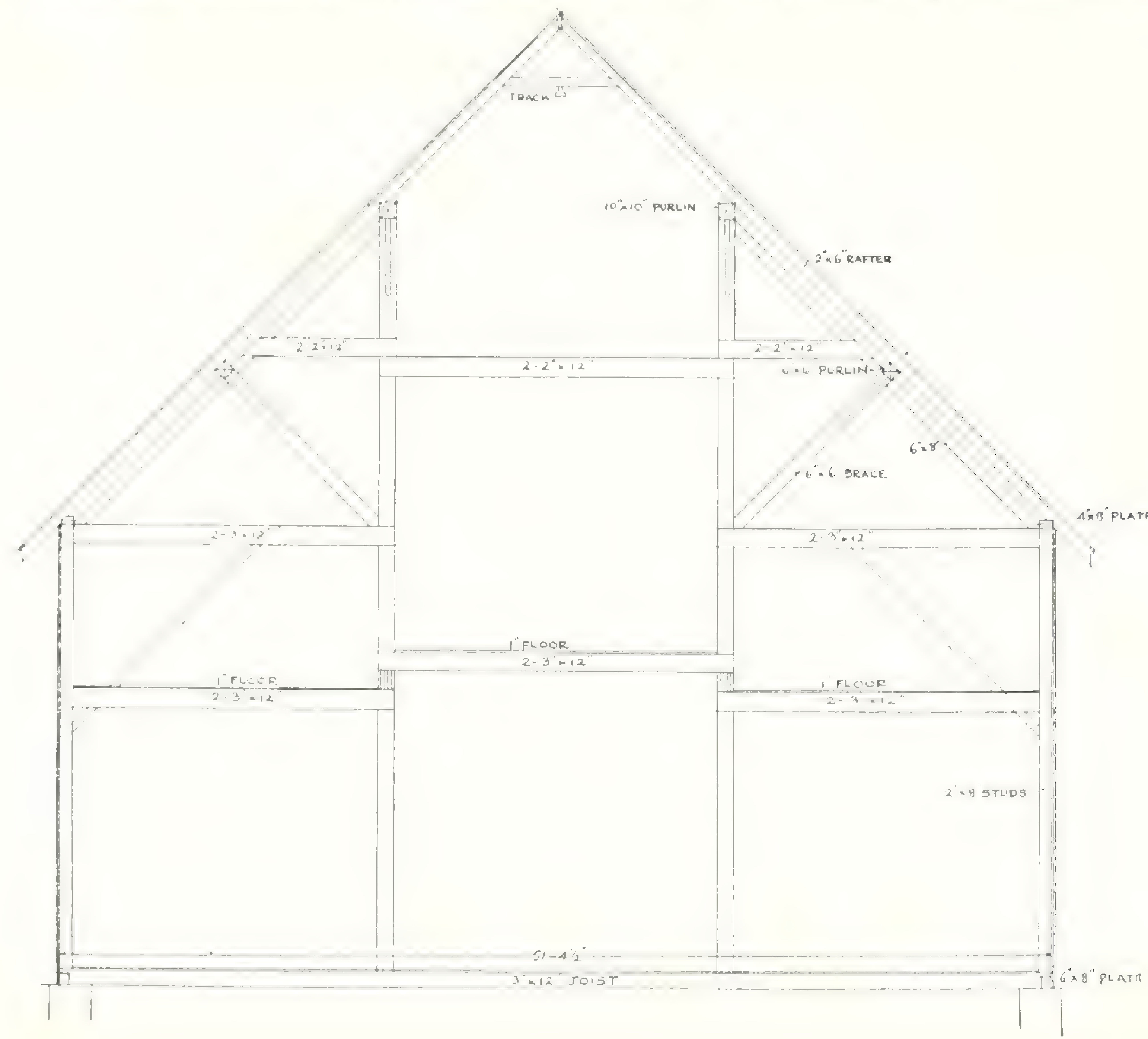
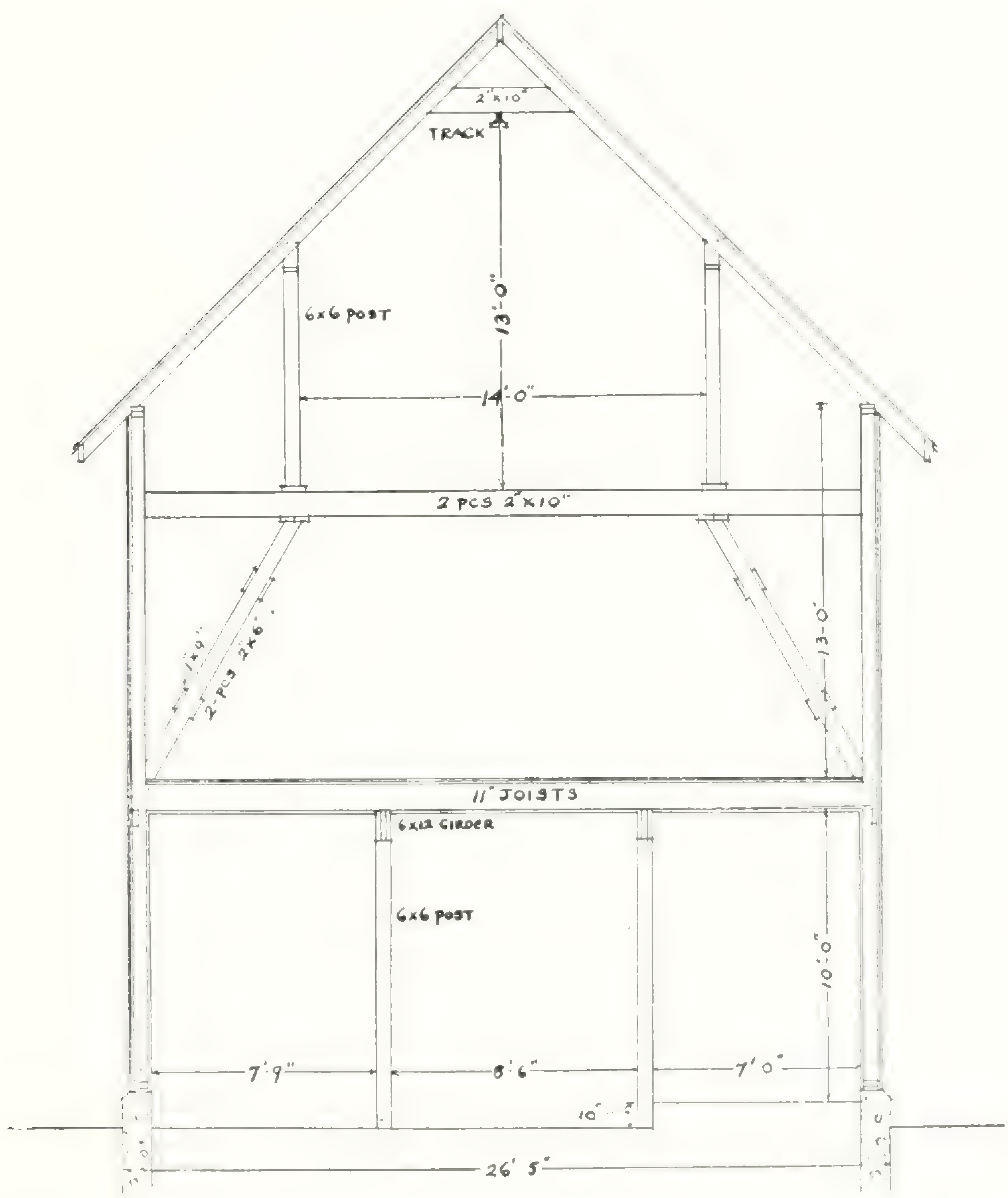


PLATE XXII

CENTRAL EXPERIMENTAL FARM
OTTAWA, ONT.



CROSS SECTION OF BULL BARN
SHEWING FRAMING – ¼ IN SCALE –

TYPES OF COW STAND FLOORS.
-¼ IN SCALE-

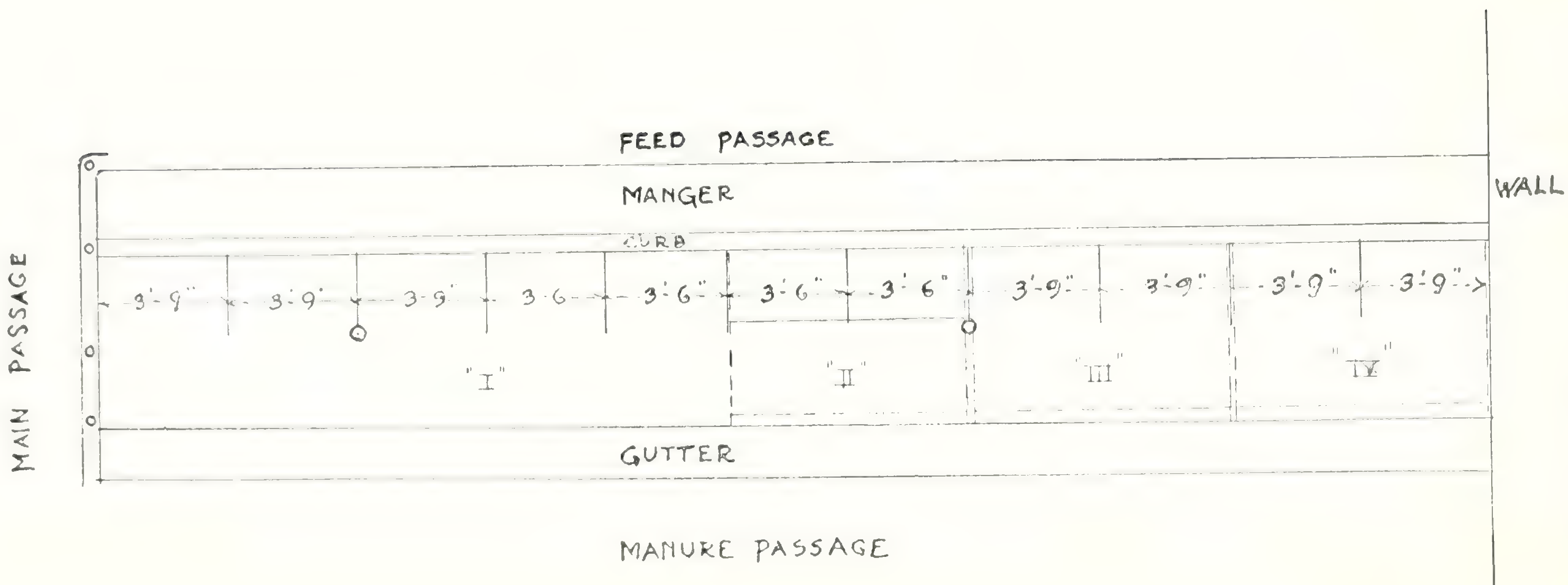
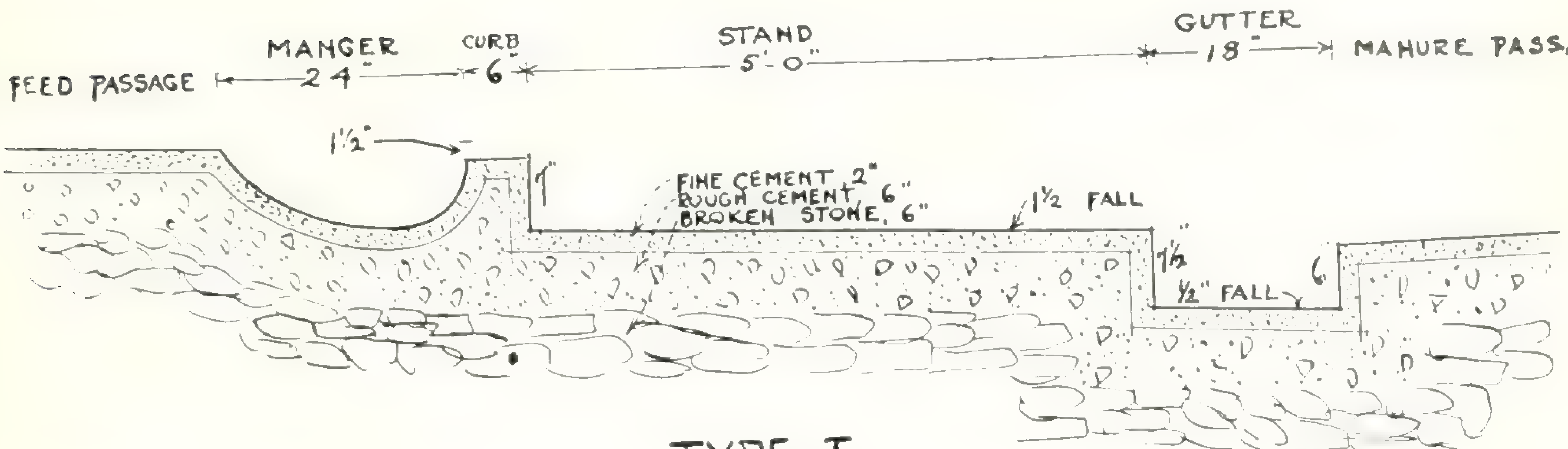


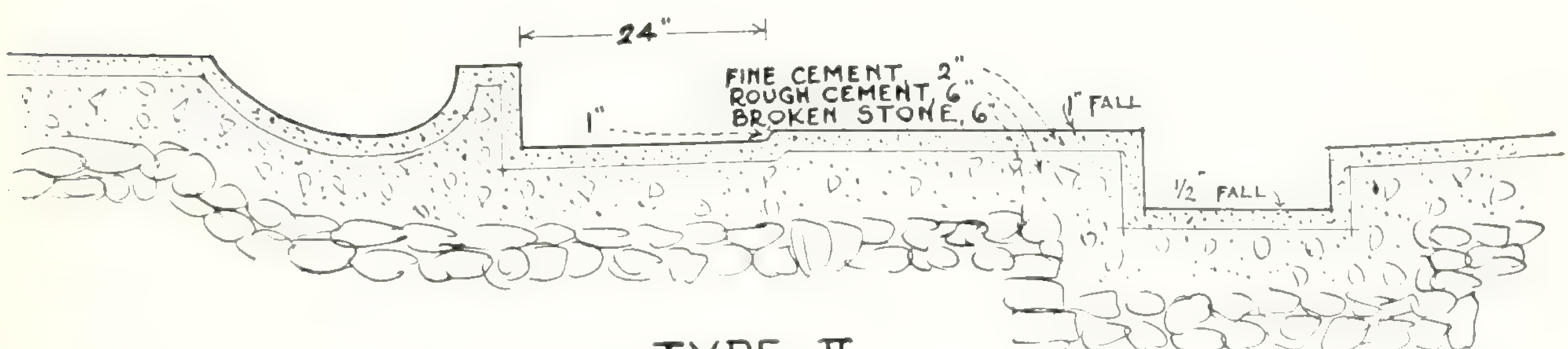
PLATE XXIV

TYPES OF COW STAND FLOORS.

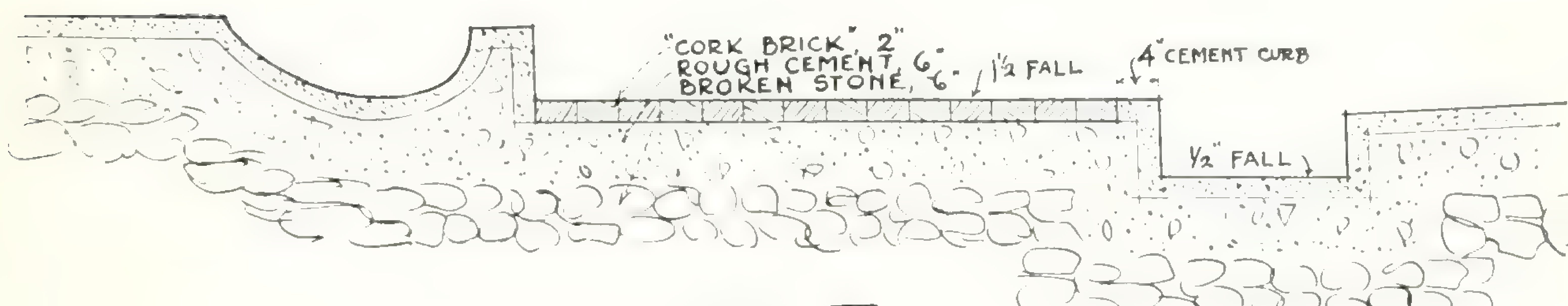
-1" IN SCALE.-



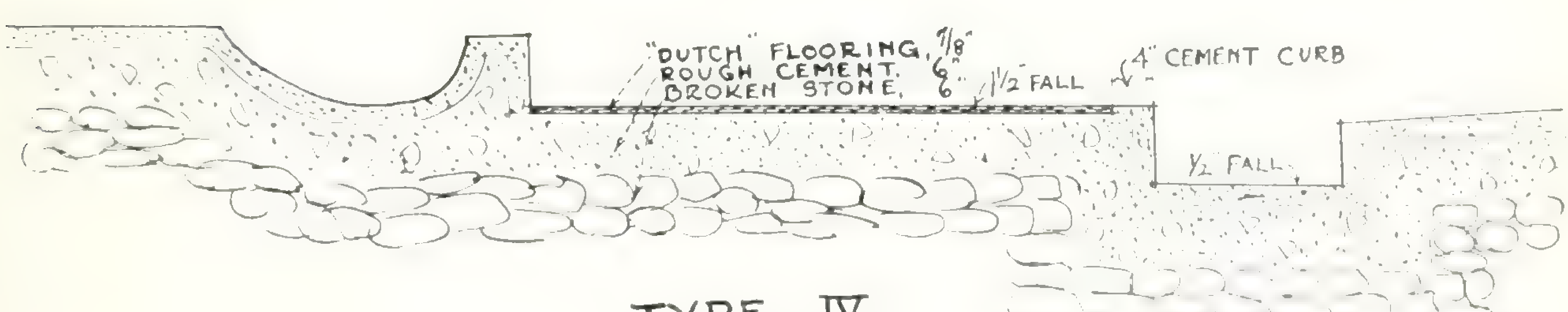
TYPE I



TYPE II



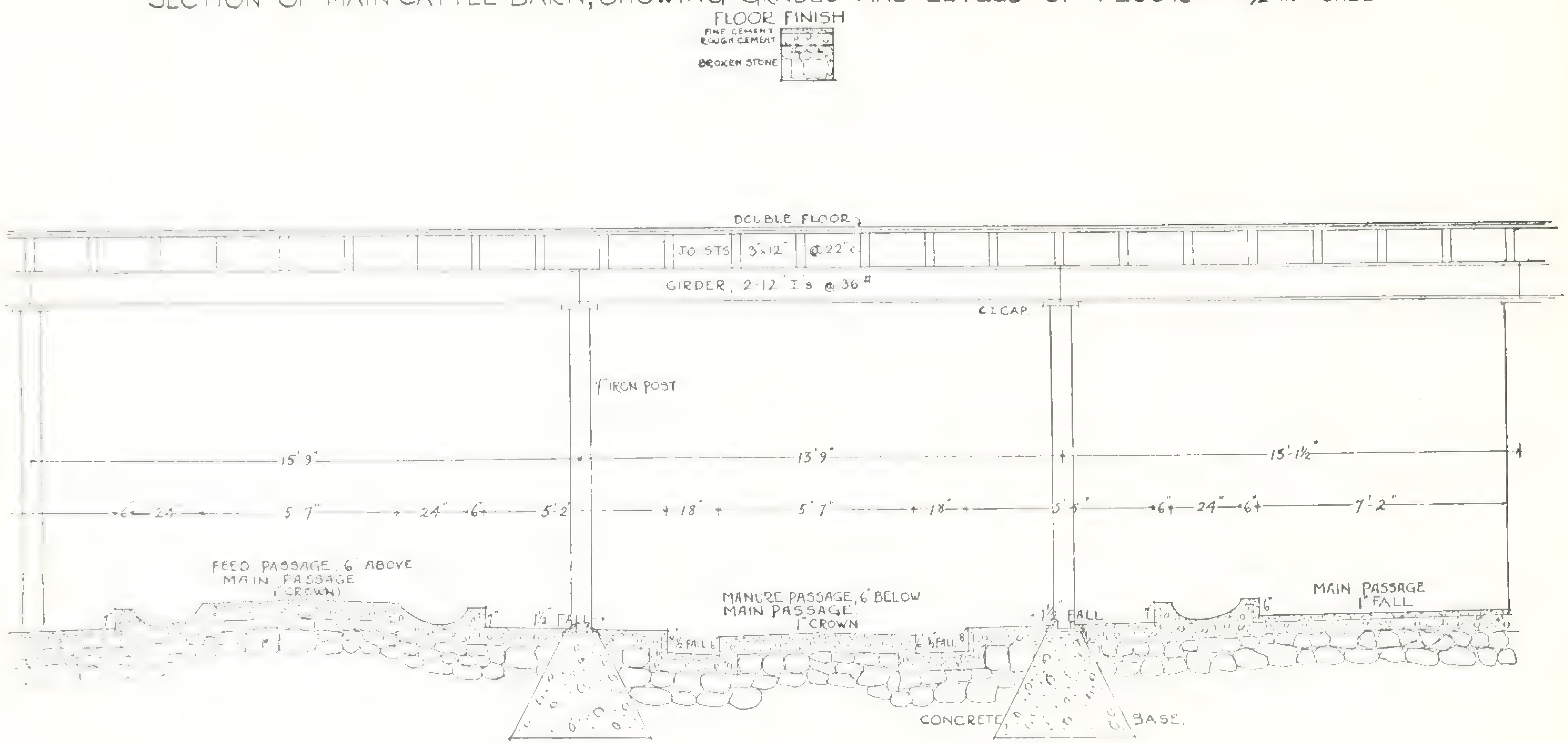
TYPE III



TYPE IV

CENTRAL EXPERIMENTAL FARM — OTTAWA ONT.

SECTION OF MAIN CATTLE BARN, SHOWING GRADES AND LEVELS OF FLOORS — ½ IN SCALE



Cattle Barn, Central Experimental Farm, Ottawa. Exterior view showing silos. Homemade cement hollow block to left and "Natco" clay tile silo to right.
(See page 400 for plans of barn.)

ing-off in period 3, perhaps caused by the protracted effects of an unpalatable ration fed for the first time. In the next two comparisons the falling-off in milk flow was quite marked: wholly insufficient, however, to prevent the regular ration from suffering when compared on a cost basis.

It is safe to say that for a period of one or two weeks, one-third of the meal ration fed to a cow in average milk flow might be removed, and provided the animal was consuming a liberal, well-proportioned roughage ration of fair quality, and containing some succulent feed, the milk production during this short period would not be sufficiently decreased to balance the consequent cheapening of the meal ration due to a removal of one-third of the latter. However, one is almost equally safe in stating that the continued feeding of only two-thirds the required, or optimum ration, would show a decrease that could not be balanced by the saving in meal at the end of the year.

That the same would apply to the experiment in question is probable. More than that, considering that certain cows refused all feed, that is, ensilage, roots, cut straw, etc., that came in contact with the meal mixture containing blackseeds and pulverized screenings, it is quite probable that, from the standpoints of both pounds of milk produced and cost to produce, the entire omission of the by-product might have still further increased and cheapened production.

The attitude of the individual cows to the screenings meal rations differed widely. Some showed little preference one for the other; others ate only portions for a few days; others refused it altogether, carefully cleaning up all the roughage with which the meal was fed and leaving practically all of the meal in the manger; others, again, refused throughout the entire period all food containing screenings. With the exception of certain animals that consistently refused the meal ration, however, the herd during the second week of the period, as a rule, consumed it cleanly.

Briefly, it would appear that on these short tests the value of screenings lies not in any palatability that it may add to a ration—not, conclusively, in its power to produce—but rather in its cheapness. Whether the complete pulverized screenings or the apparently undesirable element—blackseeds—cheap though they are, would prove economical on an extended feeding period—whether digestive disturbances or the toxic effects of probable weed seed constituents might present themselves—could not be ascertained within the necessary limits of this test.

Although no test was made of the elevator screenings with blackseeds removed in the experiments just reviewed, the inadvisability of using blackseeds as a food for dairy cows is apparent. Aside from the high percentage of crude fibre, and the actual danger of digestive derangements due to its use, blackseed is not only highly unpalatable itself, but also able to render likewise any ration or mixture of which it becomes a part. Elevator screenings with the blackseeds removed constitute a palatable and cheap foodstuff. From the grain grower's standpoint of economy it would appear advisable to screen all grain before shipment. To obtain the maximum benefit from this material it is further to be advised that its undesirable element be removed and destroyed.

DAIRY COW FEEDING EXPERIMENT No. 5.

TURNIPS *versus* MOLASSES.

In December, 1914, an experiment was conducted with a number of the aged Ayrshire cows, for the purpose of determining, if possible, the value of cane molasses in replacing roots as succulents for milch cows.

Plan of Experiment.—Meal mixture composed as follows was used throughout the experiment: Bran, 4 parts; gluten feed, 2 parts; corn meal, 2 parts; oil cake, 1 part; cottonseed, 2 parts.

Period 1.—Meal, hay, roots, 30 pounds.
Period 2.—Meal, hay, molasses, 4 pounds.
Period 3.—Meal, hay, roots, 30 pounds.

Plan of Feeding.—Each cow was fed 1 pound meal mixture for each 4 pounds of milk produced.

Each cow received what hay she would clean up during the first week of period 1, and approximately the same quantity throughout the rest of the experiment.

Each cow, when being fed roots (turnips), received 30 pounds per day.

Each cow, when being fed molasses, received 4 pounds per day poured on the hay (diluted with hot water when necessary).

Value of Feeds per Ton.—Hay, $7; turnips, $2; molasses, $23; meal, 1·3 cent per pound.

TABLE No. 5.—Dairy Cow Feeding Experiment No. 5.—Turnips *versus* Molasses.

Feeds.		Meal, Hay, Roots. — Period 1.	Meal, Hay, Roots. — Period 3.	Meal, Hay, Roots. — Periods 1 and 3 Average.	Meal, Hay, Molasses. — Period 2.
Number of cows in test		9	9	9	9
Pounds of milk produced by nine cows	lb.	1,625	1,383	1,504	1,485
Average milk per cow per day	"	25·8	22·1	23·9	23·5
Average per cent fat in milk	p.c.	3·9	4·1	4	4
Total pounds fat produced by nine cows	lb.	63·4	56·7	60·1	59·4
Average pounds fat per cow per day	"	1	0·9	0·95	0·94
Total meal consumed	"	546	546	546	546
Total hay consumed	"	630	630	630	630
Total molasses consumed	"	......	......	......	252
Total roots consumed	"	1,890	1,890	1,890	......
Roughage consumed per 100 pounds fat produced	"	3,975	4,445	4,210	1,485
Relative value for production of fat	p.c.	......	......	100	283
Roughage consumed per 100 pounds milk produced	lb.	155	182	168·5	59·4
Relative value for production of milk	p.c.	......	......	100	283
Findings from Experiment—					
Cost of meal mixture fed	$	7·09	7·09	7·09	7·09
Value of roughage fed	$	4·10	4·10	4·10	5·10
Total cost of feed	$	11·19	11·19	11·19	12·19
Cost to produce 100 pounds fat	$	17·49	19·56	18·52	20·53
Cost to produce 1 pound fat	$	0·174	0·195	0·185	0·205
Cost to produce 1 pound butter	$	0·146	0·163	0·154	0·172
Profit on 1 pound butter at 30 cents per pound	$	0·154	0·137	0·146	0·128
Cost to produce 100 pounds milk	$	0·689	0·809	0·749	0·82
Profit on 100 pounds milk at $1.70 per hundredweight	$	1·01	0·90	0·951	0·88
Total weight of cows for period	lb.	10,311	10,214	......	10,315
Gain or loss in weight	"	......	(91 loss)	......	(4 gain)

OTTAWA.

Reviewing the results, it will be seen that while the amount of roughage necessary to produce 100 pounds of fat or milk is much lower where molasses is fed, the cost to produce, as figured on the values given, is increased when compared with the average results of the root-feeding periods, while the actual production of milk during the molasses feeding period is slightly lower.

In this experiment, 254 pounds molasses, 5 pounds meal, and 6 pounds hay are equivalent to 1,890 pounds roots. At the given valuation, molasses thus has a value of $10.20 per ton for milk production.

From the results as obtained, the general conclusion may be made that while molasses may replace a part of the succulent ration, it cannot wholly replace roots either from the standpoint of increased production or lessened cost.

DAIRY COW FEEDING EXPERIMENT No. 3.

ENSILAGE *versus* MOLASSES.

At the same time as experiment No. 2 there was conducted with the aged Guernsey and Jersey cows a somewhat similar test to determine, if possible, the value of cane molasses in replacing ensilage as a succulent feed for milch cows.

Plan of Experiment.—The meal mixture used throughout the experiment was composed as follows: Bran, 4 parts; gluten feed, 2 parts; corn meal, 2 parts; oil cake, 1 part; cottonseed, 2 parts.

Period 1.—Meal, hay, ensilage, 30 pounds.

Period 2.—Meal, hay, ensilage, 15 pounds; molasses, 4 pounds.

Period 3.—Meal, hay, ensilage, 30 pounds.

Plan of Feeding.—Each cow was fed 1 pound meal mixture for each 4 pounds of milk produced.

Each cow was fed what hay she would clean up during the first week of period 1, and approximately the same quantity throughout the rest of the experiment.

Each cow received ensilage and molasses as above described, the molasses being poured on the ensilage.

Value of Feeds per Ton.—Hay, $7; roots and ensilage, $2; molasses, $23; meal, 1·3 cent per pound.

TABLE No. 6.—Dairy Cow Feeding Experiment No. 6.—Ensilage *versus* Molasses.

Feeds.		Meal, Hay, Ens. 30 lb. — Period 1.	Meal, Hay, Ens. 30 lb. — Period 3.	Meal, Hay, Ens. 30 lb. — Periods 1 and 3 Average	Meal, Hay, Ens. 15 lb. Mol. 4 lb. — Period 2.
Number of cows in test		9	9	9	9
Pounds of milk produced by nine cows	lb.	1,421	1,190	1,305	1,369
Average milk per cow per day	"	22·7	18·9	20·7	21·7
Average per cent fat in milk	p.c.	5·7	5·7	5·7	5·7
Total pounds fat produced by nine cows	lb.	80·9	67·8	74·4	78
Average pounds fat per cow per day	"	1·29	1·08	1·18	1·24
Total meal consumed	"	630	630	630	630
Total hay consumed	"	378	378	378	378
Total molasses consumed		....	....	....	252
Total ensilage consumed	"	1,890	1,890	1,890	945
Roughage consumed per 100 pounds fat produced	"	2,803	3,343	3,073	2,019
Relative value for production of fat	l.c.	....	....	100	152
Roughage consumed per 100 pounds milk produced	lb.	150	190	175	114
Relative value for production of milk	p.c.	....	....	100	152
Findings from Experiment—					
Cost of meal mixture fed	$	8·19	8·19	8·19	8·19
Value of roughage fed	$	3·21	3·21	3·21	3·84
Total cost of feed	$	11·40	11·40	11·40	12·03
Cost to produce 100 pounds fat	$	14·09	16·81	15·45	15·42
Cost to produce 1 pound fat	$	0·14	0·168	0·154	0·154
Cost to produce 1 pound butter	$	0·117	0·129	0·128	0·129
Profit on 1 pound butter at 30 cents per pound	$	0·183	0·171	0·173	0·171
Cost to produce 100 pounds milk	$	0·802	0·948	0·875	0·877
Profit on 100 pounds milk at $1.70 per hundredweight	$	0·898	0·752	0·825	0·823
Total weight of cows for period	lb.	8,890	8,814	....	8,856
Gain or loss in weight	"	....	(loss 42)	....	(loss 34)

Comparing the average of periods I and III with period II it would appear that the replacing of 15 pounds of ensilage with 4 pounds of molasses resulted in an increase in milk production sufficient to offset the greater cost of the ration. Another point worthy of notice is the falling-off in weight in both periods II and III.

In the foregoing experiment, 252 pounds of molasses is equivalent to 31 pounds meal, 20 pounds hay, and 1,039 pounds ensilage. At the valuations given for the various feeds, molasses would have a value of only $11.90 per ton for milk production.

Method of Feeding Molasses.—Brief mention might be made regarding the method of feeding molasses, this operation frequently presenting difficulty during cold weather. It was found necessary to dilute the molasses slightly with hot water and to reduce its consistency still further by heating over a small stove. It was then poured over the hay or ensilage by means of an ordinary watering-can. While molasses is frequently successfully fed in its original state, the particular requirements of these experiments made necessary the adoption of the above described method.

GENERAL CONCLUSIONS FROM EXPERIMENTS NO. 5 AND NO. 6.

The experiments just reported were not planned to induce the dairymen to discontinue the growing of roots and corn or to lessen the acreage usually devoted to these crops. Rather, it was desired to gather some information as to how molasses might be regarded among the succulent feeds and, in the event of shortage, the possibility of replacing all or parts of the ensilage or root ration with this much discussed foodstuff.

OTTAWA.

That turnips and ensilage cannot wholly be replaced by molasses has been shown. That a part of the two former feeds could be eliminated and economically replaced by molasses is probable from the results of the tests just described and from others conducted in the past two years and already reported. The value of molasses, it must be remembered, is primarily in its appetizing and tonic properties. Its best effect is, therefore, derived in an indirect way, that is, through its power to increase palatability and digestibility, with the consequent increase in the amount consumed, and the benefit derived therefrom. These desirable properties must be considered entirely aside from its actual food value, which is limited, and usually overestimated.

CALF FEEDING EXPERIMENTS.

During the past year a number of calf feeding experiments have been started, from which valuable information is being acquired. However, at the close of the fiscal year only five lots of calves had completed their experimental period, hence the complete detailed report will be given in the annual report for the coming fiscal year. A brief summary of the results of the first five lots will, however, show the work which is under way.

Lot 1, three calves 6 weeks of age at the start, fed on whole milk, clover hay, and roots, made splendid gains, which, however, cost $14.15 per hundred pounds. This lot was used as a check on the various calf meals.

Lot 2 was fed on a home-mixed calf meal composed of two parts fine ground oats, four parts fine ground corn, and one part ground flax. The three calves in this lot (4 weeks of age at the start), fed the above meal plus skim-milk plus clover hay and roots, made gains costing only $3.04 per hundred pounds.

Lot 3. The three calves in this lot were 12 weeks of age at the start of the experiment. They were fed Blatchford's calf meal as a water slop, plus clover hay and roots, but with no skim-milk. They made very satisfactory gains, which cost only $2.36 per hundred pounds. The greater and cheaper gains over lot 4 are due probably to the increased age of the calves at the start of the experiment.

Lot 4. The three calves were 8 weeks of age at the start of this experiment. They were fed Blatchford's calf meal, skim-milk, clover hay, and roots, and made very satisfactory gains, costing $4.48 per hundred pounds.

Lot 5 contained only two calves, which started this experiment at 2 weeks of age. They were fed Bibby's cream equivalent, skim-milk, clover hay, and roots. These calves made exceedingly satisfactory gains, which cost only $3.01 per hundred pounds.

The above and several other meals are being tried at the present time, ten lots of calves being in the experiment. All work is being duplicated, both during the winter and summer months, and it is hoped that before the end of the coming fiscal year a large amount of conclusive and satisfactory data will be acquired. This work is also being duplicated on several of the branch Farms, reference to which will be made elsewhere in this report.

MISCELLANEOUS EXPERIMENTS.

A number of miscellaneous experiments with dairy utensils and the like were made during the year, but the data acquired are not sufficiently complete to report on definitely.

An insulated milk or cream can for shipping purposes manufactured by the Sturges & Burn Manufacturing Co., 508 So. Green street, Chicago, U.S.A., was tested. The insulation in this can is very satisfactory. The temperature of milk shipped from the Farm to the city remained practically the same for over two hours, while milk shipped

in ordinary cans showed a rise in temperature of from 10 to 20 degrees. Further work will be done regarding the testing of this can during the coming summer.

Several types of milk strainer have been tried during the year. One which gives promise of marked success is the Ekvall sanitary milk strainer, manufactured by the Elgin Sheet Metal Products Co., Elgin, Ill., U.S.A. This is an all-metal strainer, but is so arranged in parts that the dirt does not accumulate on the surface of the strainer hence is not washed nearly as much as by the old methods of straining. Further bacteriological studies of these various milk strainers will be conducted as soon as a bacteriologist is available for such work.

Owing to the most unfavourable housing facilities for calves during the spring and summer of 1914, we were troubled with several cases of diarrhoea, which very closely resembled the contagious white scour. Several patented preventives were tried, amongst which was a patented cure called "Agronoma," manufactured by the Antimycel Chemical Co., Ottawa. Although, fortunately, there were not sufficient cases to make a thorough trial of the various cures, yet the old treatments of lime water, parched flour, and formaldehyde gave the most satisfactory results.

MILKING MACHINES.

As reported previously, the experimental work with milking machines started in the fall of 1912, the first year's work dealing largely with a comparison of the Sharples milking machine with good hand milking. All experimental work with milking machines was of necessity discontinued on October 11, 1913, due to the loss of the buildings by fire. The new building being completed, the Sharples and several other makes of milking machines were installed, and an experiment was started on November 1, 1914.

It might be well here to summarize the year's work with the Sharples mechanical milker as compared with the previous year and the subsequent year on hand milking under somewhat similar conditions. The following table gives the year's lactation periods of twenty cows during 1911 on hand milking, 1912 and the first part of 1913 with the milking machine, and the latter part of 1913 and 1914 to November 1 on hand milking.

SUMMARY for Sharples Milking Machine Experiment.

	Breed	1911, Hand Milking.				1912, Machine Milking.				1913, Hand Milking.				1914, Jan. 1 to Nov. 1, Hand Milking.			
		Age at Start.	Days Milking.	Milk Produced.	Average Milk per Day.	Age at Start.	Days Milking.	Milk Produced.	Average Milk per Day.	Age at Start.	Days Milking.	Milk Produced.	Average Milk per Day.	Age at Start.	Days Milking.	Milk Produced.	Average Milk per Day.
		Yrs.	Days.	Lb.	Lb.	Yrs.	Days.	Lb.	Lb.	Yrs.	Days.	Lb.	Lb.	Yrs.	Days.	Lb.	Lb.
Marjorie 4th	A.	3	298	6,480	21·7	4	242	5,657	23·4	.....	.....	.....	.....	.....	.....	.....	.....
Flavia 2nd	A.	5	267	9,364	35·1	6	332	10,319	31·0	7	327	9,493	29·0	8	175	7,610	43·4
Jessie D.	A.	5	273	5,905	21·6	6	287	5,415	18·8	7	237	4,746	20·0	.....	.....	.....	.....
Ottawa Kate	A.	4	281	5,644	20·0	5	367	10,451	28·4	6	395	12,262	31·0	7	183	8,192	44·7
Denty 4th	A.	4	244	7,839	32·2	5	269	8,699	32·3	6	341	7,280	21·4	7	175	6,323	36·1
Marjorie 2nd	A.	5	312	7,617	24·4	6	244	5,547	22·7	.....	.....	.....	.....	.....	.....	.....	.....
Flavia 3rd	A.	3	307	6,776	22·1	4	223	7,223	22·4	5	269	6,258	23·3	6	186	7,068	38·0
Marjorie 6th	A.	2	384	7,203	18·7	3	318	5,334	16·8	.....	.....	.....	.....	5	212	5,474	25·7
Ottawa Kate 2nd	A.	2	371	6,623	17·9	3	299	5,056	16·9	4	368	9,216	25·0	5	352	9,024	25·6
Maggie Pulchrae	A.	2	419	6,552	15·6	3	308	7,258	23·5	4	285	6,929	24·3	5	182	5,262	28·9
Denty 3rd	A.	6	335	7,635	22·8	7	288	5,448	18·9	8	408	9,757	23·9	9	406	9,671	23·8
La Belle	FC.	6	336	6,815	20·2	7	315	5,764	18·3	8	304	4,767	15·6	.....	.....	.....	.....
Fortune 4th	FC.	4	286	7,462	26·1	5	289	5,834	20·1	6	413	9,722	23·5	7	123	4,690	38·6
Aromaz	FC.	4	305	6,769	22·2	5	306	6,614	21·6	6	403	7,925	19·6	7	165	5,943	36·0
Inequette 3rd	FC.	3	261	4,803	18·4	4	396	7,810	19·7	5	381	6,830	17·9	.....	.....	.....	.....
Fortune Cadette	FC.	2	292	4,950	16·9	3	319	5,797	18·2	.....	.....	.....	.....	.....	.....	.....	.....
Archer's Pearl	G.	2	297	4,148	14·0	3	615	8,120	13·2	4	335	6,002	17·8	.....	.....	.....	.....
Ottawa-Deanie	G.	2	335	4,780	14·2	3	359	5,083	14·4	4	340	7,236	21·2	5	340	7,336	21·5
Ottawa Itchen	G.	6	280	7,029	25·1	7	296	4,269	14·4	8	350	8,415	24·0	9	349	8,481	24·2
Itchen's Favour	G.	2	546	8,370	13·5	3	363	6,389	17·6	.....	.....	.....	.....	4	271	6,384	23·5
Totals	.....	20 head.	6,429	132,764	.....	20 head.	6,385	132,087	.....	15 head	5,156	116,838	.....	13 head.	3,119	91,461	.....
Averages	.....	.....	321·4	6,638	20·7		318·4	6,604	20·6	.....	343·7	7,786	22·6	.....	239·9	7,035	29·3

N.B.—Sharples machine started July, 1912. 2. The year denotes the time when the cows freshened. 3. In 1912 year, many of the above-mentioned cows were milked a month or two by hand. 4. In 1913 year, many of the above-mentioned cows were milked two or three months by the machine.

DATA FROM FIRST EXPERIMENT.

It will be noticed that the total milk flow per cow per day in 1912 was greater than in 1911, this being due probably more to the fact that the lactation periods were shorter and the cows were one year older than to the influence of the milking machine. However, the year 1913 showed a marked increase over the year 1912. The average of the years 1911 and 1913 compared with 1912 shows that the cows have not very materially decreased in their milk flow owing to the influence of the Sharples milking machine. The very marked increase in parts of the lactation period for 1914, included in this table, is due largely to the fact that fewer cows are included and, even more important, that the lactation periods are not completed, consequently the average per cow per day is higher than it would be after all the cows had completed their full milking period. Although nothing definite can be drawn from the above table, yet we feel safe in saying that in so far as these and other figures for cows not included in this table go, the use of the milking machine has not shown a very marked decrease in the milk produced by this herd.

The quantity of strippings produced after the milking machine was quite variable, in the case of some cows the strippings after each milking amounting to from one half to 1½ pounds. These, however, were the exceptions, and the average strippings taken from the cow after the machine ranged from one eighth to 1 pound per cow per milking.

The practical difficulties encountered with this machine are as follows:—

1. Cows inclined to be nervous sometimes kick off the teat cups. These cups, not being suspended in any way, immediately fall to the floor and suck in bedding, dust, or any other filth, much to the detriment of the quality of the milk. Although such accidents are more or less rare, still it must be remembered that one accident of this kind per milking will largely deteriorate the quality of the milk for that milking if the milk is poured with the clean, pure milk from the other cows and if the machine is again used on another cow without being thoroughly washed and sterilized.

2. A little trouble was met with in the pulsators occasionally sticking, becoming slow. The careful supervision of the herdsman was required to keep these pulsators thoroughly cleaned and oiled in order that pulsation might be normal and uniform.

3. Absolute gentleness in the introduction of the machine to the cows is necessary in order not to antagonize any animals permanently against the machine.

4. The absolute cleansing of the machine was necessary in order to keep down the bacterial count. This point will be dealt with in the succeeding paragraph.

Undoubtedly it has been proved in this year's test that the successes or failures which may be met with depend very largely on the man who is operating the machine. Carelessness in adjusting the machine to the cow, lack of intelligence in operating each machine to suit the individual needs of each cow, or any similar lack of care, will undoubtedly cause a loss from that cow upon introducing the milking machine.

PURITY OF THE MILK.

During the first six months of this test it was found that the milk produced by the Sharples milking machines contained on an average three to ten times as many bacteria as that of scrupulously careful hand milking, the counts ranging from 5,000 to 70,000 bacteria per cc., as all precautions were being taken to produce the equivalent of

"certified" milk. During the three succeeding months of the test, by the aid of improved methods of washing, sterilizing, and manipulating the machine, together with the beneficial influence of the cold winter weather, far better results were obtained from the milking machine as to purity, although even here the hand-produced milk contained, as a rule, less than one-third the total bacteria. As the warmer weather of the summer of 1913 advanced, the milking machine again showed much greater difficulty in producing pure milk than by good, careful hand milking. All samples for these tests were taken from the cans immediately after the straining of the milk. In all cases it was found that when the rubber tubing was new and perfectly smooth, the machine-produced milk compared very well with hand-produced milk; but as soon as the surface of the rubber showed any wear, the bacterial count immediately rose from three to ten times the former count, owing to the impossibility of thoroughly cleansing the rubber surface from adhering milk. In either hand-milking or machine-milking the purity of the milk is dependent on the following factors:—

(1.) The cleanliness of the cows.
(2.) The purity of the air in the barn.
(3.) Careful milking to eliminate contamination.
(4.) Thorough washing and sterilizing of the utensils which come in contact with the milk at any period of its handling.

The sterilizing of the milking machine was studied carefully. No figures sufficiently definite for publication were acquired. Roughly speaking, however, it is safe to say that rinsing the machine with cold and afterwards with lukewarm water will produce a bacterial count in the milk from 200 to 500 times as great as good careful hand milking; whereas the careful rinsing in cold and then hot water containing a good washing soda, and this followed by a thorough cleansing with the brushes provided, the steam sterilizing of all metal parts, and the sterilizing of all the rubber parts in a 10 per cent salt solution, 5 per cent limewater solution, or 2½ per cent formalin solution, will give far more satisfactory results, and, if other precautions are also taken, the bacterial count should not range above five or six times that of careful hand milking.

PATHOLOGICAL EFFECT OF MACHINE ON COWS.

No ill-effects whatever on the cows' teats resulted from the use of the milking machine. After the machine commenced in the test a case of what appeared to be contagious garget was noticed. This rapidly disappeared and the cow came back to nearly her normal flow. Several other cases appeared shortly after, but, although the best pathologists were consulted regarding this matter, and the milk was studied carefully bacteriologically, yet, unfortunately, no organisms were isolated. It would appear, however, that this was a form of contagious garget, and could in no way be charged to the machine. The great disadvantage of any milking machine in a herd where contagious garget prevails is not that the machine induces this trouble in any sense, but is due to the fact that the machine may be spreading this trouble for one or two milkings before any thickness is noted either in the udder or in the milk taken from the same. A careful, intelligent hand milker, on the other hand, would probably notice this at once, with the result that in the future this cow, until cured, would be milked last and would probably be isolated from the other cows, her milk being also kept separate. This is an unfortunate fault of mechanical milking, but can be quite largely overcome by the careful observation of the man operating the machine.

PRESENT EXPERIMENTS WITH MILKING MACHINES.

On October 1, 1914, a new series of experiments was started, comparing good hand milking with the Burrell-Lawrence-Kennedy milker and the Sharples machine. In

addition to these two machines, two newer models, namely, the Empire and the Lister milking machines, are also installed, for comparative purposes. The first year of this second series of experiments with milking machines is for the comparison of the various machines with each other and with good hand milking. As yet, only three of the experimental periods out of a total of twelve have been completed, and it would be unwise to give these data without the more conclusive duplication in the latter part of the experiment.

DAIRY HERD RECORDS.

Following are the dairy cow milk records for all cows which have finished a lactation period during the fiscal year ending March 31, 1915. Special attention is drawn to the fact that a number of the best cows in each of the herds had not at this date finished their lactation period, hence the following figures would not be a fair comparison of the breeds.

In the case of heifers with their first calves, charges for feed include the consumption from a date two months previous to parturition, to the time of being dried off preparatory to their second calving. In the case of heifers and cows 3 years old and over, charges for feed include the period in which they were dry previous to the lactation period herein reported.

In estimating the cost of feeds, the following values were used:—

Pasture, per month	Per cow.	$ 1 00
Meal mixture	Per ton.	25 00
Hay	"	7 00
Straw	"	4 00
Roots and ensilage	"	2 00
Green feed	"	3 00

These valuations represent fairly well the cost of raising these products, as contained in the report of the Field Husbandry Division for the Central Experimental Farm.

In calculating the value of products, 30 cents per pound is allowed for butter and 20 cents per hundred pounds for skim-milk and buttermilk. In reality, a considerable quantity of milk conforming to the "certified" standard has again been sold at $3 per hundred pounds; the price of butter ranged from 30 to 35 cents per pound; cream cheese sold realized over $3 per hundred pounds of milk; and coulommier cheese sold realized from $2.20 to $3 per hundred pounds of milk.

However, the above figures chosen for calculation were regular market values and form a basis for comparison of the various individuals in the herd with each other, for this and previous fiscal years, as well as with individuals of other herds on the branch Farms and Stations or on the farms of private individual farmers.

In computing these returns it will be noted that the bedding and labour in connection with the caring for cattle and also the manufacture of butter, cost of handling milk, and the like, have not been accounted for. On the other hand, the value of the manure made and the value of the calves at birth will more than counterbalance the above-mentioned items, although not sufficiently to overcome the interest and depreciation of the buildings and cattle. However, the following statements are used as a general basis for calculating the returns from the cattle, and the other items may be added by any farmer as they may be required.

Although the following list represents the cows which have finished a lactation period during the year, yet it does not by any means represent the total number of cows which have been milked during the past fiscal year, as many have failed to finish their lactation period.

OTTAWA.

OFFICIAL RECORDS OF PRODUCTION.

Although the herd records on the Central Experimental Farm are always considered official, yet the policy of the Farm is to place individual cows under tests similar to the cows of private individuals, and conduct the same under similar supervision. In consequence of this policy, pure-bred individual cows from the various herds on the Central Experimental Farm have during the past year been entered in the Record of Performance. The table given herewith of cows which have completed their official test is interesting for comparison with the herd records given in the second following table.

CANADIAN Record of Performance (April 1, 1914, to March 31, 1915).

Name of Cow.	Breed.	Age at commencement of test.	Number of days milking.	Pounds of milk produced.	Pounds of fat produced.	Average per cent fat.
			Days.	Lb.	Lb.	p. c.
Denty 3rd of Ottawa	Ayrshire	8 years	365	9,271	416	4·48
Ottawa Kate 2nd	Ayrshire	4 years 31 days	365	9,097	404	4·44
Ottawa Deanie	Guernsey	4 years 108 days	345	7,355	431	5·86
Ottawa Itchen	Guernsey	8 years	361	8,546	473	5·52
Beulah Clay 3rd	Holstein	2 years 105 days	365	9,394	301	3·20
Brampton Blue Duchess	Jersey	4 years 42 days	365	9,775	514	5·25
Brampton Oakland's Trial	Jersey	3 years 342 days	365	9,082	578	6·36

Names and Breeds of Cows.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of days in Lactation Period.	Total pounds of Milk for Period.	Daily average Yield of Milk.	Average per cent Fat in Milk.	Pounds of butter produced in period.	Value of Butter at 30c. per pound.
	Yrs		Days.	Lb.	Lb.	p. c.	Lb.	$ cts.
Brampton Oakland's Trial..........J.	3	Nov 10, 1913...	417	9,674	23·1	6·72	765·35	229 60
Jennie of Parkdale..............G.H	6	May 22, 1913...	525	15,157	28·8	3·84	685·35	205 60
Brampton Blue Duchess............J.	4	Nov. 20, 1913...	376	9,726	25·8	5·41	619·42	185 82
Ottawa Itchen.....................G.	8	Nov. 16, 1913...	361	8,544	23·6	5·43	546·28	163 88
Inoquette........................F.C.	10	May 9, 1913...	417	7,928	19·0	5·28	492·54	147 76
Ottawa Deanie....................G.	4	Nov. 25, 1913...	345	7,352	21·3	5·85	506·70	152 01
Mountain Queen.................G.H.	5	Feb. 23, 1914...	342	10,735	31·3	3·82	484·18	145 25
Itchen's Girl......................G.	4	Oct. 14, 1913...	328	7,099	21·6	5·52	461·57	138 47
Jennie Dean......................G.A.	7	Dec. 13, 1913...	352	10,796	30·6	4·24	538·76	161 62
Aromaz..........................F.C.	5	Mar. 14, 1913...	403	7,925	19·6	5·31	495·27	148 58
Fortune 4th of Ottawa.........F.C.	6	May 21, 1913...	416	9,722	23·3	4·44	508·78	152 63
Sangster's Mayflower...........G.H.	7	Sept. 23, 1913...	495	13,301	26·8	3·68	575·88	172 76
Annie Laurie....................G.A.	7	Dec. 2, 1913...	322	10,034	31·1	4·06	479·86	143 95
Brampton Sultana Tena (imp.)....J.	4	Sept. 1, 1913...	344	6,753	19·6	5·57	442·78	132 83
Ottawa Itchen's Favour...........G.	5	Feb. 4, 1914...	391	7,320	18·7	5·40	465·37	139 61
Denty 3rd of Ottawa...............A.	8	Aug. 29, 1913,..	406	9,671	23·8	4·29	488·28	146 48
Betty...........................G.A.	8	Dec. 15, 1913...	440	10,838	24·6	3·85	491·50	147 45
Ottawa Kate 2nd..................A.	4	Nov. 14, 1913...	372	9,106	24·4	4·30	461·49	138 44
Fortune Cadette.................F.C.	4	Jan. 31, 1914...	391	7,982	20·4	4·47	420·00	126 00
Arthur's Princess...............G.H.	5	Nov. 24, 1912...	522	13,799	26·4	3·18	516·25	154 87
Archer's Pearl.....................G.	4	Oct. 20, 1913...	336	6,002	17·8	5·59	395·17	118 55
Surprise........................G.H.	6	Dec. 24, 1913...	377	11,892	31·5	3·33	467·28	140 18
Polly 2nd.......................G.A.	6	May 14, 1913...	367	9,619	26·2	3·49	396·04	118 81
Tannahill's Diamond...........G.H.	6	Oct. 13, 1913...	441	11,942	27·0	3·47	488·32	146 49
Pearly's Maid......................G.	3	Jan. 6, 1914...	388	6,066	15·6	5·56	397·20	119 16
Arthur's Rose...................G.H.	7	Feb. 24, 1914...	353	9,582	27·1	3·90	439·94	131 98
Maud...........................G.A.	6	Feb. 3, 1914...	260	6,332	24·3	4·47	333·31	99 99
Beulah Clay 3rd....................H.	2	June 23, 1913...	361	9,412	26·0	3·42	379·23	113 76
Mountain Jewel.................G.H.	8	Feb. 23, 1914...	331	9,392	28·3	3·60	398·02	119 40
Ruby's Pride......................G.	4	Jan. 12, 1914...	322	5,200	16·1	5·87	359·36	107 80
Brampton Rosa Bonheur...........J..	4	Sept. 11, 1913...	352	5,841	16,5	5·03	345·76	103 72
La Belle.........................F.C.	9	May 23, 1914...	307	5,759	18·7	4·54	308·21	92 46
Lavene.........................G.H.	6	Jan. 30, 1914...	280	7,553	26·9	3·64	324·27	97 28
Itchen's Pride......................G.	4	July 4, 1913...	385	5,906	15·3	5·02	349·44	104 83
Nussey.........................G.H.	5	Feb. 8, 1914...	351	8,366	23·8	3·55	350·05	105 01
Milkmaid.......................G.A.	9	Jan. 17, 1914...	287	7,617	26·5	3·94	353·44	106 03
Flavia 3rd of Ottawa...............A.	6	Apr. 30, 1914...	314	8,208	26·1	3·89	376·23	112 86
Operatrice......................F.C.	5	Aug. 28, 1913...	483	6,992	14·4	4·54	374·05	112 21
Dolly...........................G.A.	7	Oct. , 1913...	414	7,689	18·5	4·31	390·75	117 22
Maggie Pulchrae....................A.	5	May 3, 1914...	333	7,344	22·0	3·97	342·47	102 74
Elegante Poupee.................F.C.	3	June 9, 1913...	351	5,208	14·8	4·92	301·52	90 45
Marjorie 6th of Ottawa.............A.	4	Apr. 27, 1914...	286	6,414	22·4	4·33	327·28	98 18
Zaza Fille 2nd..................F.C.	4	Apr. 5, 1914...	255	4,989	19·5	4·66	273·63	82 08
Flavia (imp).......................A.	11	Sept. 22, 1913...	367	7,974	21·7	3·79	355·58	106 67
De Clairvaux....................F.C.	2	Sept. 24, 1913...	331	5,676	17·1	3·86	257·91	77 37
Inoquette 4th...................F.C.	4	Nov. 7, 1913...	332	4,329	13·0	5·43	276·96	83 08
Daisy...........................G.A.	7	Feb. 27, 1914...	293	5,433	18·5	3·90	249·66	74 89
Duchesse Sauvee.................F.C.	5	Apr. 5, 1914...	292	4,508	15·4	5·18	275·04	82 51
Pearl...........................G.H.	8	Feb. 1, 1914...	234	4,759	20·3	3·92	219·51	65 85
Clothilde Hengerveld Korndyke.H.	3	Sept. 4, 1913...	456	5,949	13·0	3·85	269·54	80 86

OTTAWA.

Value of Skim-milk at 20c. per cwt.	Total value of Product.	Amount of Meal eaten, at 1¼c. per pound.	Amount of Roots and Ensilage eaten, at $2 per ton.	Amount of hay eaten, at $7 per ton.	Amount of Green Feed eaten, at $3 per ton.	Amount of Straw eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total cost of Feed between calvings.	Cost to Produce 100 pounds of Milk.	Cost to Produce 1 pound of Butter, skim-milk neglected.	Profit on 1 pound of Butter, skim-milk neglected.	Profit on Cow between calvings, labour and calf neglected.
$ cts.	$ cts.	Lb.	Lb.	Lb.	Lb.	Lb.	Mo.	$ cts.	Cts.	Cts.	Cts.	$ cts.
18 04	247 64	4,209	8,360	3,039	3,700	302	1	78 75	81·4	10·2	19·8	168 89
29 14	234 74	4,900	19,085	2,634	6,740	505	......	100 66	66·4	14·6	15·4	134 08
18 39	204 21	4,186	7,585	2,853	3,700	178	1	76 78	78·9	12·3	17·7	127 43
16 15	180 03	4,064	8,545	2,892	5,170	298	1	78 80	92·2	14·4	15·6	101 23
15 01	162 77	3,304	7,060	2,673	2,450	183	2	63 74	80·3	12·9	17·1	99 03
13 84	165 85	3,404	7,585	2,853	3,700	178	1	67 01	91·1	13·2	16·8	98 84
20 68	165 93	4,118	6,940	1,974	3,700	246	......	71 35	66·4	14·7	15·3	94 58
13 41	151 88	2,956	6,060	2,487	3,700	56	1	58 37	82·2	12·6	17·4	93 51
20 67	182 29	4,897	13,460	2,352	3,700	352	......	89 15	82·5	16·5	13·5	93 14
15 00	163 58	3,696	12,105	2,634	2,450	557	1	73 29	92·4	14·7	15·3	90 29
18 57	171 20	4,167	13,965	3,192	2,450	634	1	83 14	85·5	16·3	13·7	88 06
25 62	198 38	5,820	17,145	3,588	5,380	220	......	110 95	83·4	19·2	10·8	87 43
19 25	163 20	3·966	12,695	2,088	3,700	352	......	75 81	75·5	15·8	14·2	87 39
12 75	145 58	3,031	5,860	2,283	3,700	56	1	58 39	86·4	13·1	16·9	87 19
13 84	153 45	3,528	6,920	2,919	3,700	240	1	68 26	93·2	14·6	15·4	85 19
18 51	164 99	4,534	8,790	3,037	6,450	259	2	88 26	91·2	18·0	12·0	76 73
20 84	168 29	4,877	15,855	2,808	3,700	352	......	92 88	85·6	18·8	11·2	75 41
17 42	155 86	4,419	8,195	2,888	4,000	178	1	80 87	88·8	17·5	12·5	74 99
15 25	141 25	2,998	12,550	2,676	3,720	358	1	66 67	83·5	15·8	14·2	74 58
26 72	181 59	5,245	25,405	3,022	3,040	924	....	107 93	78·2	20·9	9·1	73 66
11 33	129 88	2,853	6,060	2,487	3,700	56	1	57 08	95·1	14·4	15·6	72 80
22 98	163 16	5,249	8,945	3,198	3,700	240	......	91 77	77·1	19·6	10·4	71 39
18 56	137 37	3,506	13,365	2,148	3,040	577	......	70 40	73·1	17·7	12·3	66 97
23 05	169 54	5,662	18,045	2,454	3,700	352	......	103 64	86·7	21·2	8·8	65 90
11 45	130 61	3,406	5,810	2,646	3,700	302	1	64 79	106·8	16·3	13·7	65 82
18 41	150 39	4,248	17,215	2,460	3,700	169	......	84 80	88·4	19·2	10·8	65 57
12 09	112 08	2,691	6,000	1,275	3,700	....	......	49 64	78·3	14·8	15·2	62 44
18 17	131 93	3,652	6,395	2,838	3,450	176	2	69 49	73·8	18·3	11·7	62 44
18 10	137 50	4,118	11,710	1,854	3,700	....	......	75 21	80·0	18·8	11·2	62 29
9 78	117 58	2,912	4,485	2,385	3,700	122	1	56 01	107·7	15·5	14·5	61 57
11 09	114 81	2,868	5,855	2,379	3,700	56	1	56 68	97·0	16·3	13·7	58 13
10 97	103 43	2,257	5,360	1,172	5,100	364	1	47 04	81·6	15·2	14·8	56 39
14 55	111 83	2,956	9,090	1,392	3,700	....	......	56 46	74·7	17·4	12·6	55 37
11 21	116 04	3,013	7,140	2,259	4,650	176	1	61 02	103·3	17·4	12·6	55 02
16 13	121 14	3,593	7,900	2,573	3,700	....	......	67 36	80·5	19·2	10·8	53 78
14 63	120 66	3,392	12,180	2,088	3,700	414	......	68 25	89·6	19·3	10·7	52 41
15 77	128 63	4,194	6,000	3,130	4,000	274	1	76 91	93·7	20·4	9·6	51 72
13 34	125 55	3,695	9,585	3,321	3,700	302	1	74 53	106·5	19·9	10·1	51 02
14 71	131 93	4,308	13,361	2,382	3,700	512	......	82 11	106·7	21·0	9·0	49 82
14 10	116 84	3,850	4,675	2,878	4,000	274	1	70 40	95·8	20·5	9·5	46 44
9 90	100 35	2,975	7,025	2,317	2,450	197	1	57 36	110·1	19·0	11·0	42 99
12 27	110 45	3,204	8,140	3,516	4,000	168	1	67 82	105·7	20·7	9·3	42 63
9 51	91 59	2,287	8,590	2,326	5,100	184	1	54 32	108·8	19·8	10·2	37 27
15 34	122 01	3,835	13,025	3,409	6,450	473	2	85 49	107·2	24·0	6·0	36 52
10 91	88 28	2,825	5,685	2,325	3,700	....	1	55 67	98·0	21·5	8·7	32 61
8 18	91 26	2,898	6,835	2,673	3,700	118	1	59 18	136·7	21·3	8·9	32 08
10 44	85 33	2,860	6,960	1,464	3,700	....	......	53 38	98·2	21·3	8·7	32 95
8 54	91 05	2,446	10,520	2,656	5,080	362	1	59 72	132·4	21·7	8·3	31 33
9 12	74 97	2,402	6,770	1,116	3,700	....	......	46 24	97·1	21·0	9·0	28 73
11 43	92 29	3,424	8,525	3,318	4,000	150	1	70 23	118·0	26·0	4·0	22 06

AYRSHIRES.

Name of Cow.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of Days in Lactation Period.	Total pounds of Milk for Period.	Daily Average Yield of Milk.	Average per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 30c. per Pound.
	Yrs.		Days	Lb.	Lb.	p. c.	Lb.	$ cts.
Denty 3rd of Ottawa	8	Aug. 29, 1913	406	9,671	23·8	4·29	488·28	146 48
Ottawa Kate 2nd	4	Sept. 22, 1913	372	9,106	24·4	4·30	461·49	138 44
Flavia 3rd of Ottawa	6	Apr. 30, 1914	314	8,208	26·1	3·89	376·23	112 86
Maggie Pulchrae	5	May 3, 1914	333	7,344	22·0	3·97	342·47	102 74
Marjorie 6th of Ottawa	4	Apr. 27, 1914	286	6,414	22·4	4·33	327·28	98 18
Average, 5 best	5		342	8,148	23·7	4·15	399·15	119 74

CANADIANS.

Name of Cow.	Age (Yrs.)	Date of Dropping Calf.	Days	Lb. Milk	Daily Lb.	p. c.	Lb. Butter	$ cts.
Inoquette	10	May 9, 1913	417	7,928	19·0	5·28	492·54	147 76
Aromaz	5	Mar. 14, 1913	403	7,925	19·6	5·31	495·27	148 58
Fortune 4th of Ottawa	6	May 21, 1913	416	9,722	23·3	4·44	508·78	152 63
Fortune Cadette	4	Jan. 31, 1914	391	7,982	20·4	4·47	420·00	126 00
La Belle	9	May 23, 1914	307	5,759	18·7	4·54	308·21	92 46
Average, 5 best	7		386	7,863	20·2	4·80	444·96	133 48

GRADE AYRSHIRES.

Name of Cow.	Age (Yrs.)	Date of Dropping Calf.	Days	Lb. Milk	Daily Lb.	p. c.	Lb. Butter	$ cts.
Jennie Dean	7	Dec. 13, 1913	352	10,796	30·6	4·24	538·76	161 62
Annie Laurie	7	Dec. 2, 1913	322	10,034	31·1	4·06	479·86	143 95
Betty	8	Dec. 15, 1913	440	10,838	24·6	3·85	491·50	147 45
Polly 2nd	6	May 14, 1913	367	9,619	26·2	3·49	396·04	118 81
Maud	6	Feb. 3, 1914	260	6,332	24·3	4·47	333·31	99 99
Average, 5 best	7		348	9,523	27·3	4·02	447·89	134 36

GRADE HOLSTEINS.

Name of Cow.	Age (Yrs.)	Date of Dropping Calf.	Days	Lb. Milk	Daily Lb.	p. c.	Lb. Butter	$ cts.
Jennie of Parkdale	6	May 22, 1913	525	15,157	28·8	3·84	685·35	205 60
Mountain Queen	5	Feb. 23, 1914	342	10,735	31·3	3·82	484·18	145 25
Sangster's Mayflower	7	Sept. 23, 1913	495	13,301	26·8	3·68	575·88	172 76
Arthur's Princess	5	Nov. 24, 1912	522	13,799	26·4	3·18	516·25	154 87
Surprise	6	Dec. 24, 1913	377	11,892	31·5	3·33	467·28	140 18
Average, 5 best	6		452	12,976	28·9	3·57	545·76	163 73

GUERNSEYS.

Name of Cow.	Age (Yrs.)	Date of Dropping Calf.	Days	Lb. Milk	Daily Lb.	p. c.	Lb. Butter	$ cts.
Ottawa Itchen	8	Nov. 16, 1913	361	8,544	23·6	5·43	546·28	163 88
Ottawa Deanie	4	Nov. 25, 1913	345	7,352	21·3	5·85	506·70	152 01
Itchen's Girl	4	Oct. 14, 1913	328	7,099	21·6	5·52	461·57	138 47
Ottawa Itchen's Favour	5	Feb. 4, 1914	391	7,320	18·7	5·40	465·37	139 61
Archer's Pearl	4	Oct. 20, 1913	336	6,002	17·8	5·59	395·17	118 55
Average, 5 best	5		352	7,263	20·6	5·55	475·01	142 50

OTTAWA.

AYRSHIRES.

Value of Skim Milk at 20c. per cwt.	Total Value of Product.	Amount of Meal Eaten, at 1¼c. per pound.	Amount of Roots and Ensilage eaten, at $2 per ton.	Amount of Hay eaten, at $7 per ton.	Amount of Green Feed eaten, at $3 per ton.	Amount of Straw eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total Cost of Feed between Calvings.	Cost to Produce 100 pounds Milk.	Cost to Produce 1 pound Butter.	Profit on 1 pound Butter (skim-milk neglected)	Profit on Cow between calvings (labour and calf neglected).
$ cts.	$ cts.	Lb.	Lb.	Lb.	Lb.	Lb.	Mos.	$ cts.	Cts.	Cts.	Cts.	$ cts.
18 51	164 99	4,534	8,790	3,037	6,450	259	2	88 26	91·2	18·0	12·0	76 73
17 42	155 86	4,419	8,195	2,888	4,000	178	1	80 87	88·8	17·5	12·5	74 99
15 77	128 63	4,194	6,000	3,130	4,000	274	1	76 91	93·7	20·4	9·6	51 72
14 10	116 84	3,850	4,675	2,878	4,000	274	1	70 40	95·8	20·5	9·5	46 44
12 27	110 45	3,204	8,140	3,516	4,000	168	1	67 82	105·7	20·7	9·3	42 63
15 61	135 35	4,040	7,160	3,089	4,490	230	1·2	76 85	95·0	19·4	10·6	58 50
CANADIANS.												
15 01	162 77	3,304	7,060	2,673	2,450	183	2	63 74	80·3	12·9	17·1	99 03
15 00	163 58	3,696	12,105	2,634	2,450	557	1	73 29	92·4	14·7	15·3	90 29
18 57	171 20	4,167	13,965	3,192	2,450	634	1	83 14	85·5	16·3	13·7	88 06
15 25	141 25	2,998	12,550	2,676	3,720	358	1	66 67	83·5	15·8	14·2	74 58
10 97	103 43	2,257	5,360	1,172	5,100	364	1	47 04	81·6	15·2	14·8	56 39
14 96	148 44	3,284	10,208	2,469	3,234	419	1·2	66 77	84·6	15·0	15·0	81 67
GRADE AYRSHIRES.												
20 67	182 29	4,897	13,460	2,352	3,700	352	......	89 15	82·5	16·5	13·5	93 14
19 25	163 20	3,966	12,695	2,088	3,700	352	......	75 81	75·5	15·8	14·2	87 39
20 84	168 29	4,877	15,855	2,808	3,700	352	......	92 88	85·6	18·8	11·2	75 41
18 56	137 37	3,506	13,365	2,148	3,040	577	......	70 40	73·1	17·7	12·3	66 97
12 09	112 08	2,691	6,000	1,275	3,700	....	......	49 64	78·3	14·8	15·2	62 44
18 28	152 64	3,987	12,275	2,134	3,568	408	......	75 57	79·0	16·7	13·3	77 07
GRADE HOLSTEINS.												
29 14	234 74	4,900	19,085	2,634	6,740	505	......	100·66	66·4	14·6	15·4	134 08
20 68	165 93	4,118	6,940	1,974	3,700	246	......	71 35	66·4	14·7	15·3	94 58
25 62	198 38	5,820	17,145	3,588	5,380	220	......	110 95	83·4	19·2	10·8	87 43
26 72	181 59	5,245	25,405	3,022	3·040	924	......	107 93	78·2	20·9	9·1	73 66
22 98	163 16	5,249	8,945	3,198	3,700	240	......	91 77	71·1	19·6	10·4	71 39
25 03	188 76	5,066	15,504	2,883	4,512	427	......	96 53	74·3	17·8	12·2	92 23
GUERNSEYS.												
16 15	180 03	4,064	8,545	2,892	5,170	298	1	78 80	92·2	14·4	15·6	101 23
13 84	165 85	3,404	7,585	2,853	3,700	178	1	67 01	91·1	13·2	16·8	98 84
13 41	151 88	2,956	6,060	2,487	3,700	56	1	58 37	82·2	12·6	17·4	93 51
13 84	153 45	3,528	6,920	2,919	3,700	240	1	68 26	93·2	14·6	15·4	85 19
11 33	129 88	2,853	6,060	2,487	3,700	56	1	57 08	95·1	14·4	15·6	72 80
13 71	156 21	3,361	7,034	2,727	3,994	165	1	65 90	90·7	13·8	16·2	90 31

HOLSTEINS.

Name of Cows.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of Days in Lactation Period.	Total pounds of Milk for Period.	Daily Average Yield of Milk.	Average per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 30c. per Pound.
	Yrs.		Days	Lb.	Lb.	p. c.	Lb.	$ cts.
Beulah Clay 3rd	2	June 23, 1913	361	9,412	26·0	3·42	379·23	113 76
Clothilde Hengerveld Korndyke	3	Sept. 4, 1913	456	5,949	13·0	3·85	269·54	80 86
Average, 2 cows	2·5		408	7,680	19·5	3·63	324·38	97 31

JERSEYS.

Name of Cows.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of Days in Lactation Period.	Total pounds of Milk for Period.	Daily Average Yield of Milk.	Average per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 30c. per Pound.
Brampton Oakland's Trial	3	Nov. 10, 1913	417	9,674	23·1	6·72	765·35	229 60
Brampton Blue Duchess	4	Nov. 20, 1913	376	9,726	25·8	5·41	619·42	185 82
Brampton Sultana Tena (imp.)	4	Sept. 1, 1913	344	6,753	19·6	5·57	442·78	132 83
Brampton Rosa Bonheur	4	Sept. 11, 1913	352	5,841	16·5	5·03	345·76	103 72
Average, 4 cows	4		372	7,998	21·0	5 68	543·32	162 99

HOLSTEINS.

Value of Skim-milk at 20c. per cwt.	Total Value of Product.	Amount of Meal eaten, at 1¼c. per pound.	Amount of Roots and Ensilage eaten, at $2 per ton.	Amount of Hay eaten, at $7 per ton.	Amount of Green Feed eaten, at $3 per ton.	Amount of Straw eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total Cost of Feed between Calvings.	Cost to produce 100 pounds Milk.	Cost to Produce 1 pound Butter.	Profit on 1 pound Butter (skim-milk neglected).	Profit on Cow between Calvings (labour and calf neglected).
$ cts.	$ cts.	Lb.	Lb.	Lb.	Lb.	Lb.	Mos.	$ cts.	Cts.	Cts.	Cts.	$ cts.
18 17	131 93	3,652	6,395	2,838	3,450	176	2	69 49	73·8	18·3	11·7	62 44
11 43	92 29	3,424	8,525	3,318	4,000	150	1	70 23	118 0	26·0	4·0	22 06
14 80	112 11	3,538	7,460	3,078	3,725	163	1·5	69 86	95·9	22·1	7·8	42 25

JERSEYS.

18 64	247 64	4,209	8,360	3,039	3,700	302	1	78 75	81·4	10·2	19·8	168 89
18 [illegible]	204 21	4,186	7,585	2,853	3,700	178	1	76 78	78·9	12·3	17·7	127 43
12 75	145 58	3,031	5,860	2,283	3,700	56	1	58 39	86·4	13·1	16·9	87 19
11 09	114 81	2,868	5,855	2,379	3,700	56	1	56 68	97·0	16·3	13·7	58 13
15 06	178 06	3,573	6,915	2,633	3,700	148	1	67 65	85 9	13·0	17·0	110 41

CO-OPERATIVE MILK RECORDS.

During the past year an increasing number of applications were received for milk and feed record forms—which are distributed free of charge upon application to this Division. This is a gratifying indication of the rapidly improving methods being adopted by the dairy farmers in keeping records for the individual cows of their herds. Apparently, however, there are still many farmers who are not aware of this free distribution of record forms. The following is a list of the forms for distribution:—

Month long.—Daily milk records suitable for herds numbering up to twenty-two cows.

Week long.—Daily milk records suitable for herds numbering up to sixteen cows.

Week long.—Daily milk records suitable for herds numbering up to twenty-four cows.

Monthly summary records.

Yearly summary records.

Feed record forms.

It should be clearly understood that the object of this free distribution is not in any way to overlap the work of the Cow Testing Associations of the Dairy and Cold Storage Branch, Department of Agriculture; but rather to encourage individual farmers, especially in districts where cow testing associations are not developed, so that these individuals may in turn eventually form the nucleus of record centres.

DISPOSAL OF MILK.

As previously reported, milk produced on the Central Experimental Farm during the past three years has been marketed as certified milk, butter, cream cheese, Coulommier cheese, Cheddar cheese, and only a very limited quantity of milk and cream sold to farm employees who had not the facilities of the city distribution. No new phases of experimental manufacturing or marketing of cheese have been tried during the past year. Complete details of the success of the above-mentioned methods may be found in previous annual reports. It is sufficient to say that the demand for all manufactured products has increased very rapidly, and that the returns on the milk continue to be very satisfactory to the dairy. Milk marketed in these various ways nets from $1.60 to $3 per hundred pounds. Pamphlets on the question of the manufacture of these products may be obtained upon application to this Division.

NEW DAIRY CATTLE BARNS.

CENTRAL EXPERIMENTAL FARM.

The accompanying plans and photographs of these barns are for the most part self-explanatory. Nevertheless a few brief specifications may help to make these illustrations more intelligible and explain their purposes.

These buildings were erected on the same site and as a replacement of the somewhat similar structures destroyed by fire on October 11, 1913. The work of clearing away the débris was commenced immediately after the fire, and the exterior of the two wings and the foundation of the main barn completed before the end of that calendar year. These buildings were completed and thoroughly equipped during the fall of 1914.

OTTAWA.

This Division, under the supervision of the Director, planned the details of this building and, to a certain extent, supervised the construction. Special credit is due Mr. J. B. Ker, the farm foreman carpenter, not only for a great deal of assistance in the planning of these barns, but also for the direct laying out and supervising of all carpenter and stone-mason work. Great credit is also due to the farm foreman, Mr. D. D. Gray, for the thoroughness with which he hastened the clearing away of the débris and supplied men and materials for the laying of all concrete work.

The purpose of these buildings is for the housing of the five pure-bred dairy herds on this Farm, and the conducting of experimental breeding and feeding work with such animals. These structures are thus special-purpose barns, and would not be recommended in their general layout and all details as commercial barns. The extra size and the extra storage capacity, the placing of cattle rows to conduct the best tests of breeds and feeds, and all such special outlay and equipment, would be unnecessary in a farmer's barn. Nevertheless the details of the structure and the finish of same illustrate the most modern and economical types of farm buildings, and such may be well applied to any practical farmer's barn.

Special attention is being given to the comparison of the most modern types of fittings, floor finish, stall floors, water basins, milking machines, and all such details, which assist in sanitation, comfort, economy, and efficiency in handling dairy cattle. It is hoped that, in the course of two years, complete and correct data regarding all such will be available for distribution.

It is a self-evident fact that much of the modern cow barn equipment is not only an extravagance but is a useless expenditure, as many fittings are neither of economic or permanent efficiency, nor do they tend toward the most sanitary conditions. All the details of the structure of these barns have been made with the purpose of illustrating simplicity, economy, and durability of construction, and of the natural result thereof, namely, the greatest economy in maintaining the most sanitary conditions.

Permanency is a point often overlooked by farmers anticipating the remodelling of old or the building of new farm structures. This lack of foresight is often excused on the grounds of heavy expenditure. If the farmer will but make definite plans of the location and buildings required and, based on such plans, do from year to year as much as possible to complete permanent buildings, it would save the heavy interest on such buildings were they completed in a short time, and would also save many subsequent changes and remodellings.

The Main Dairy Barn.

The main barn is of the "bank barn" type, but set sufficiently high to allow good-sized windows on the bank side. The basement accommodates eighty-eight cows and heifers tied in stands, and also all the necessary feed, motor, milk, and wash rooms for the main barn and the two wings. The two wings provide accommodation for bulls and calves, together with all necessary box stalls, hospital, etc. An annex to the main barn joins the feed room to the silos and provides ample room for the dumping of ensilage and mixing the same with cut hay or straw.

SUPERSTRUCTURE.

The foundation of the main barn is of stone, with a cut, shoddy facing. This gives a very pleasing appearance to the barn and makes a very strong wall at a fairly reasonable cost.

The superstructure above the foundation is of wood. This is a plank frame type of barn with a square pitch roof. All the frame was made from 2 by 8, 2 by 10, and 2 by 12 planking. The only steel used in this superstructure was the 12-inch I-beams for the two main lines of girts through the barn, and the 7-inch round iron posts supporting this line of steel girts. All the joists, posts in the storage barn above, and all other framework were of made timbers, as given in the plans.

Special attention is drawn to the roofing of this barn. As other materials for roofing have been tried on other barns previously reported on, it was decided to use "Asbestoslate" shingles for a comparison with wood, metal, and other prepared roofings. To date, this "Asbestoslate" shingle has appeared very efficient and promises durability. This shingle is cheaply laid, is spark-proof from without, and has a smothering effect on fire within the barn, hence should add considerably to the fire protection of the live-stock buildings.

THE COW STABLE FLOORS.

All the main floors in the main barn and wings, feed rooms, milk rooms, and power rooms are of concrete. These floors were laid with a 4-inch rough coat of 1, 2 and 4 composition, and finished with a surface coat 1½ inch thick of 1 to 3 composition. All the passageways, and particularly the manure passages, were given a smooth finish and then heavily rolled with a cement roller to give the dented finish, to prevent the animals from slipping. All sharp grades, particularly the passageways leading to the barn, were deeply cross-lined at every 5 inches, and also rolled.

CATTLE STANDS.

Attention is drawn to the different materials used in the cattle stands. Two patented floorings were tried, namely, the "Dutch Flooring," which shows a surface somewhat similar to cement, and the "Kent Cork Brick." Aside from these two floors for the cattle stands, concrete floors laid in two different ways were also tried. Provision was also made for the testing out of straw mats under the fore-feet of the cattle, in order to save and add to the comfort of the animals. In this way five different types of flooring will be tested out.

MANGERS.

The mangers in the cattle barn are of two types. Six mangers are so constructed with the elevated feed passage that the top of the manger is the edge of the feed passage. This is a very cheap and efficient type of manger, and one which cuts down the labour of feeding to a minimum. Two other mangers were constructed with a 10-inch curbing forming the front of the manger. This is proving fairly satisfactory, the great difficulty being that the animals throwing feed over the front of the manger can still see the same and are inclined to reach, with the possible danger of slipping. All mangers were given a very smooth finish.

MANURE GUTTERS.

The manure gutters were constructed in the usual style, namely, 18 inches in width, 7½ inches in depth next the cattle stand, 6 inches in depth next the manure passage, and with a ½-inch fall in bottom from the stand toward the passage. Aside from this, the manure gutters were graded from one end to the other.

LEVELS.

The main passage running lengthwise of the barn is 5½ inches above the manure passage and 5½ inches below the feed passage. The rear of the cattle stand is 2 inches higher than the manure passage. The manger bottoms are 1½ inches higher than the fronts of the stands. The divisions between the mangers and the stands are of concrete, same being 7 inches higher than the front of the stands and 5½ inches above the manger bottom. The levels of the floors of the feed room, the two end passages of the barn, the motor rooms, and the main passage of the two wings to this barn are all the same as the lengthwise passage of the main barn.

OTTAWA.

SLOPES.

The cattle stands have a slope of 1½ inch from front to rear, excepting type 3 stand, which has a depression at the fore-feet, 2 feet from the manger curbing, and then a fall of 1 inch to the rear of stand. The feed passages and manure passages have a crown of 1 inch to centre. The bottom of the gutter is 1½ inch higher next the cattle stand than next the manure passage. The mangers and the gutters have a slope of 2 inches from one end to the other, and with facilities for thorough drainage. The main passage has a slope of 1 inch toward the ends of feed passages and manure passages. These slopes facilitate the cleaning of the barn and allow a perfect drainage towards the ends of mangers and gutters from all parts of the floor of the barn. The floors of the milk room, wash room, feed room and silo room are all graded toward floor traps, thus allowing thorough washing and the greatest cleanliness.

CATTLE STALLS.

Four makes of cattle stalls and stanchions were tried in pairs of rows. The makers of these steel stalls and stanchions, with their addresses, are as follows: Beatty Bros., Fergus, Ont.; Canadian Potato Machinery Co.; Galt, Ont.; Louden Machinery Co., Guelph, Ont.; Superior Barn Equipment Co., Fergus, Ont. All these stalls and stanchions to date have been fairly satisfactory. Further details regarding their comparative values will be available for distribution in the course of another year. The specifications for all these different makes called for a stall as simple and strong as possible. A single post between the heads of the cattle, a single head-rail, and a single curved division between the cows, with the necessary stanchion and attachments, make a stall which is comparatively cheap and is fully as efficient as a more elaborate type.

DRAINAGE.

A main drain 8 inches in diameter runs the full length of the barn toward the farm sewer. Into this drain drop the 4-inch drains from the ends of the gutters and mangers. In order to prevent materials getting into these 4-inch drains which would clog the same, a plug was fitted in the mouth of the drains, bored in the centre for a 2-inch screw plug; hence only small bits of refuse which would float through a 2-inch hole have access to the main drains or the branches. The floor drains of all the rooms elsewhere specified also drop into the 8-inch main drain. All such floor drains are supplied with traps to prevent the return of sewage gas.

WATER.

Four different makes of water bowl were tested in the cattle rows. The makers of these are as follows: Beatty Bros., Fergus, Ont., two types; Canadian Potato Machinery Co., Galt, Ont., one type; Gould, Shapley and Muir Co., Brantford, Ont., one type.

Water at tap is also available in the wash room and in other parts of the barn where needed.

WALLS AND CEILINGS.

Over the stone walls an inside jacketing of sheathing, leaving a 2-inch air space, insulates perfectly. The underside of the joists is also sheathed with V-joint, thus giving good insulation in the ceiling.

LIGHT.

As much light as the strength of the walls would permit was installed in this barn. The windows in the walls and doors are as large as possible. This main barn accommo-

dates eighty-eight head and has a lighting capacity of $10\frac{1}{2}$ square feet of glass per head. Direct sunlight reaches almost every part of this barn, which renders it very sanitary, bright, and cheerful.

VENTILATION.

A modified Rutherford system of ventilation is used in this barn. Owing to the peculiar location, all the fresh-air intakes are brought in at the north and east sides of the barn. These are carried under the flooring from the main ducts through individual ducts to the intakes next the wall. These intakes are each 8 inches wide and 32 inches long. Allowing for the difference between a direct intake system and this more indirect intake system in the loss of flow of fresh air by friction; there are provided 16 square inches of intake per head.

The foul-air outlets, three in number, each 2 by 4 feet inside measurement, allow nearly 38 square inches of outlet per cow. This is rather more than is necessary, but is readily controlled. These foul-air outlets are not placed in the centre of the building, but somewhat to one side of the centre in order to allow a clear centre barn floor in the centre of the superstructure. These outlets run vertically to the line of rafters, following the same to the peak, where they are capped by cupolas. These foul-air outlets are constructed in the usual way, namely, two ply of inch matched lumber with a 1-inch air space and 1 ply of paper between. This makes a perfect foul-air outlet and one which allows no condensation and dripping.

The fresh-air intakes in the outside ventilator hood have control dampers. The foul-air outlets also have control dampers in the form of keys, with cords attached for their manipulation.

The windows of this barn are two sashes, the upper one of which is hinged to the lower sash, opening inward from the top. These have a special spiral control, which is very cheap and efficient. By the tilting of these upper sashes at any angle by means of control cords, more fresh air than is admitted through the fresh-air intakes may be allowed when warm weather necessitates. Screens, both for the windows and the door sashes, are supplied, which allow added ventilation during the warm summer months, as well as preventing the entrance of flies. Storm sashes are provided for all windows in order to control the temperature and the ventilation better during the winter months.

MILK AND WASH ROOMS.

By a small amount of excavation underneath the driveway, two very commodious rooms for sinks and lockers and for the weighing of milk were provided. The walls of these rooms were plastered with cement, allowing a 2-inch air space around the sides in order to ensure insulation. The ceiling of these rooms was lined with V-joint, and an air space above, providing good insulation. These two rooms are simply but efficiently equipped and are proving very satisfactory.

FEED-ROOM.

The feed-room facilities of this barn are now excellent. A trap door in the ceiling allows the entrance of the pulped roots in a very convenient spot. A dust-proof chute allows the entrance of either cut straw or cut hay from the storage barn above. Meal chutes from bins in the storage barn are also conveniently arranged. A set of flush floor scales allows the weighing of all feeds leaving the feed room for the various parts of the barn. Into this room also enters the ensilage from the small silo room attached thereto. With this simple arrangement a thorough control of all foodstuffs may be maintained.

OTTAWA.

MOTOR ROOM.

A small but convenient motor room is situated in the southwest corner of the main barn. This room is practically fireproof, as the walls, ceiling, and floor are of concrete. In this room is placed a 25-horsepower motor for the driving of a counter-shaft in the main storage barn, thus performing all pulping, grinding, thrashing, straw cutting, and the like. This motor also drives a short counter-shaft running out between the two silos, thus providing power for the cutting of the corn for silage.

A small motor for the driving of the pumps of the various makes of milking machines is also situated in this room, together with the pumps and vacuum tanks of these machines. This change of power from gasolene to electricity in the main barn is proving very satisfactory, both in the form of cheaper power and also less waste of labour and greater general efficiency. From a fire-protection standpoint this new system should be very efficient.

MILKING MACHINES.

Two types of milking machines were installed in this barn. These two types are the Sharples mechanical milker and the Burrell-Lawrence-Kennedy milking machine. Two other makes of milkers were also recently installed, but operated in conjunction with the Burrell-Lawrence-Kennedy pump and vacuum pipes. These are the Lister and the Empire mechanical milkers. Further reference is made to these machines elsewhere in this report.

SILOS.

As different makes and types of silos were being tried elsewhere on the Central Experimental Farm it was deemed advisable to try two fireproof silos. After careful consideration it was decided to erect one home-made reinforced hollow cement block silo and one vitrified clay tile silo manufactured by the National Fire Proofing Co., of Hamilton, Ont. These two silos are 22 feet inside diameter and 38 feet inside height. This latter dimension includes a 6-foot solid cement foundation wall 16 inches in thickness. Both silos are well reinforced with iron rods or bands, and have remained in perfect condition during the nine months since their construction. It is rather too soon to make any comparisons either between these silos or the various makes of wood silos at the other barns; however, it can be said that, for the past winter at least, both silos were very efficient in preventing freezing to any great extent, and in the preservation of a first quality of ensilage.

MISCELLANEOUS.

The manure is wheeled from the barn in wheelbarrows, and dropped in the yard, where it is each day hauled to the field. For this particular type of barn, and in this location, this is considered probably the most economical method of handling the manure.

No root storage is provided in this barn, as ample storage room is available elsewhere on the Farm. The roots are hauled as needed to the pulper on the barn floor.

Different types of dustproof hay and straw chutes are being tried in this barn, all of which add materially to the ease in maintaining a sanitary barn with the least possible amount of labour expended.

CALF BARN.

The east wing from the main barn is specially fitted for calves. This is a two-story building, but not of the "bank barn" type. The details of this building are so similar to the main barn, and where dissimilar are so clearly shown in either the plans or photographs that few explanatory notes are needed.

OTTAWA.

ACCOMMODATION

This barn contains seventeen calf pens and two maternity stalls. If filled with calves, this barn will accommodate upwards of seventy head of calves of ages ranging from birth to 14 months.

FLOORS.

The main passage and the most of the pens are floored with concrete. The pens have a depression of 3 inches below the edge of the passage, the passageway having a crown of 1 inch to the centre. Two other types of flooring for the calf pens were also tried, namely, the "Dutch Flooring" and the "Kent Cork Brick."

MANGERS.

The mangers were also made of concrete, the bottoms of the mangers being 1 inch above the passage level

CALF PENS.

It was deemed advisable to put tight divisions between the calf pens, not only to prevent draughts, but also to prevent any contagious trouble, such as contagious scours, from travelling through the barn. The pen fronts, however, were chosen of the steel stanchion front type. These are proving very satisfactory to date. Guard-rails were placed in front of the stall fronts in order to keep visitors from bothering the calves while eating. This equipment was supplied by the Superior Barn Equipment Co., of Fergus, Ont.

CONVENIENCES.

Water is supplied to each calf pen in a large "B-T" water basin.

The ventilation of this barn is of the Rutherford system, similar to the main barn.

A set of flush floor scales inserted in the end of the passageway allows for the weighing of calves on feeding experiments, also for the weighing of foodstuffs.

This calf barn is simple, convenient, and very sanitary. To date, calves have been as a rule, more healthy than ever before, due quite largely to the new quarters.

BULL BARN.

The west wing to the main barn is also a two-story barn, but not of the "bank barn" type. The superstructure of this barn is exactly the same as of the calf barn. The conveniences and general arrangements, too, are quite similar, hence but few detailed notes are necessary.

Only one row of bull pens was installed in this barn, the feed passage being against the east wall. The floor of the bull pens is 10 inches lower than the passage and although not shewing the animals, perhaps, to best advantage, yet the pens are much safer and the feed passage very much cleaner. Each bull pen has a doorway leading to a bull yard on the west side of this barn. This yard, tightly constructed, allows for the exercising of the bulls, either loose or on a cable.

At the south end of this barn is a commodious hospital sufficiently large to accommodate six head.

No water is supplied in basins to the bulls, but all other conveniences are given, to facilitate economy in feeding, comfort, and sanitary conditions for the animals.

OTTAWA.

FINANCIAL STATEMENT FOR DAIRY CATTLE.

Below are submitted inventories and returns for dairy cattle on the Central Experimental Farm for the year April 1, 1914, to March 31, 1915.

	April 1, 1914.		March 31, 1915.		Returns, including sales of dairy produce, breeding cattle, and bull service.	Gross returns, including increased values and sales.
	No.	Value.	No.	Value.		
		$		$	$	$
Dairy cattle	140	24,275 00	159	27,570 00	13,769 64	18,264 64

Returns.

By increased value of herds	$ 3,295 00	
Returns from dairy products	11,526 55	
Returns from sales of cattle	2,221 09	
Returns from bull service	22 00	
Returns from manure, 1,200 tons at $1	1,200 00	
Gross returns		$ 18,264 64

Expenditures.

To value of foodstuffs consumed	$ 9,136 14	
Cost of labour	5,156 63	
Cost of new stock purchased	2,505 00	
Gross expenditures		$ 16,797 77
Net balance from dairy cattle		$ 1,466 87

Ottawa.

EXPERIMENTAL STATION, CHARLOTTETOWN, P. E. I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

DAIRY COW.

One grade Guernsey cow was kept to supply milk for the men. She calved June 8, and after recovering from an attack of milk fever, produced 6,646 pounds of milk in ten months. Her profit over the year's expenses was $63.09. She was milking well at the close of the fiscal year, when she was sold to make room for two purebred Ayrshire cows, " Island Queen of Spruce Row " and " Lady Petunia of Spruce Row." These promising young cows are the beginning of an Ayrshire herd for this Station.

The following data were recorded:—

Number of days milking		293
Number of pounds of milk ($9\frac{1}{2}$ months)	Lb.	6,421
Amount of hay fed, counted for one year	"	1,811
Amount of oats fed counted for one year	"	1,621
Amount of bran fed, counted for one year	"	1,816
Amount of roots fed, counted for one year	"	10,540
Pasture, $5\frac{1}{2}$ months at $1 per month	$	5 50
Cost of feed	"	65 34
Value of milk, 2,568·5 quarts at 5 cents per quart	"	128 43
Balance	"	63 09

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

DAIRY CATTLE GRADING EXPERIMENT.

OBJECT OF EXPERIMENT.

The object of this experiment is to discover the actual cash value of the pure-bred dairy sire in the herd of common and mixed breeding, in the increased production of progeny, as well as the proportionately greater market value. The outline for this experiment will be found in the annual report for the year ending March 31, 1913.

The results of the experiment to date, April 1, 1915, have been most encouraging. A good percentage of heifer calves has been dropped. Twelve heifers, termed "foundation heifers," have dropped their first lot of calves from the Ayrshire cross, Holstein cross, and Guernsey cross; also second crop from the Ayrshire cross, yielding four heifers, and have completed their first three lactation periods.

The first crop of calves (first cross Ayrshire), of which there are eight, born in the fall of 1911, have dropped their first and second crops of calves (second cross Ayrshire), yielding in the fall of 1913 five heifers, and in the fall of 1914 five heifers. These in turn will be bred to freshen at 24 months of age. They, with their dams, will always be bred to a pure-bred Ayrshire bull from a good milking strain. The eight first cross Ayrshire heifers have just completed their first lactation period.

The second crop of calves from foundation cows (first cross Holsteins), of which there were six dropped in the fall of 1912, have dropped their first crop (second cross Holstein), yielding three heifers, which in turn will be bred to freshen at 24 months of age. They, with their dams, will always be bred to a pure-bred Holstein bull from a good milking strain.

The third crop of calves from foundation cows (first cross Guernsey), calved in the fall of 1913, of which there are three, will freshen in the fall of 1915.

While the experiment is yet young, so to speak, there is, however, a marked improvement in the greater percentage of the progeny, in that they are promising to be superior to their dams. This is most striking in the percentage of fat in milk. In almost every case the progeny have given a higher test than their dams.

The following table will give the results of the third year's work in milk production of the foundation cows, also the first year's work in milk production of the first cross Ayrshire heifers.

RECORDS OF

Name.	Date of Dropping Calf.	Number of days in Lactation Period.	Total Pounds of Milk for Period.	Daily Average Yield of Milk.	Average per cent Fat in Milk.	Pounds of Butter Produced in Period.
		Dys	lb.	lb.	p. c.	lb.
Maggie	April 10, 1914	283	6,666·2	23·55	4·0	319·54
Vera	Dec. 21, 1913	299	6,840·6	22·87	3·6	293·16
Mossy	Dec. 27, 1913	302	4,885·6	16·17	4·8	280·09
Jean	April 8, 1914	251	5,961·2	23·75	3·9	273·54
Jessie	Feb. 3, 1914	264	5,149·3	19·50	4·2	25[illegible]·52
Bell	Jan. 26, 1914	315	7,253·8	23·04	4·0	344·25
Queen	Jan. 7, 1914	292	6,111·3	20·92	4·3	314·95
Ella	Dec. 17, 1913	355	6,771·4	19·07	4·0	325·17
Myrtle	Jan. 17, 1914	219	5,066·2	23·13	3·7	225·87
Georgie	Feb. 25, 1914	285	4,097·6	14·37	3·9	[illegible]9·96

FIRST CROSS

Mossy 1A	Dec. 27, 1913	292	3,309·5	11·30	4·8	187·63
Jean 1A	Feb. 22, 1914	293	5,013·7	17·11	4·0	238·69
Jessie 1A	Nov. 14, 1913	341	4,278·5	12·54	4·8	239·49
Queen 1A	Dec. 6, 1913	310	4,037·6	13·02	4·7	223·76
Ella 1A	Feb. 25, 1914	306	4,641	15·16	4·3	2[illegible]5·74
Myrtle 1A	Nov. 11, 1913	350	2,060	5·88	4·1	99·70
Spot 1A	Jan. 11, 1914	266	4,244·6	15·95	4·5	227·47
Lessie 1A	Jan. 7, 1914	266	3,885	14·60	4·0	183·97

NAPPAN.

Dairy Herd.

Value of Butter at 30c. per pound.	Value of Skim-milk at 20 cents per hundred-weight.	Total value of Product.	Amount of Meal eaten, at 1¼ cents per pound.	Amount of Roots and Ensilage eaten, at $2 per ton.	Amount of Hay eaten at $7 per ton.	Amount of Green Feed at $3 per ton.	Months on Pasture, at $1 per month.	Total Cost of Feed for Period.	Cost to Produce 100 pounds Milk.	Cost to Produce 1 pound Butter (Skim-milk neglected).	Profit on 1 pound Butter (Skim-milk neglected).	Profit on Cow during Period, Labour and Calf neglected.
$ cts.	$ cts.	$ cts.	lb.	lb.	lb.	lb.	Mos.	$ cts.	$ cts.	cts.	cts.	$ cts.
95 86	12 79	108 65	1,623	7,760	3,977½	3,499	4⅔	51 87	0 77	16·23	13·77	56 78
86 95	13 18	101 13	2,165	9,440	3,607½	3,499	4⅔	59 03	0 86	20·13	9·87	42 10
84 03	9 03	93 06	1,771	9,760	3,727½	3,499	4⅔	54 85	1 12	19·58	10·42	38 21
82 06	11 46	93 52	1,431	8,240	3,157½	3,499	4⅔	47 09	0 78	17·21	12·79	46 43
75 76	9 87	85 63	1,710	10,120	3,862½	3,499	4⅔	54 89	1 06	21·73	8·27	30 74
103 28	13 93	117 21	2,129	10,240	3,892½	3,499	4⅔	60 34	0 83	17·81	12·19	56 87
94 48	11 68	106 16	2,002	9,000	3,442½	3,499	4⅔	55 99	0 91	17·77	12·23	50 17
97 55	12 99	110 54	2,323	13,440	5,117½	3,499	4⅔	70 30	1 03	21·63	8·37	40 24
67 76	9 75	77 51	1,810	10,600	4,042½	3,499	4⅔	57 28	1 12	25·35	4·65	20 23
56 99	7 87	64 86	1,336	8,880	3,397½	3,499	4⅔	47 37	1 15	24·93	5·07	17 49

AYRSHIRE.

56 29	6 28	62 57	1,255	8,980	3,397½	3,499	4⅔	46 46	1 40	24·76	5·24	16 11
71 61	9 62	81 23	1,530	8,120	3,112½	3,499	4⅔	48 04	0 95	20·12	9·88	33 19
71 83	8 15	79 98	1,735	12,600	4,792½	3,499	4⅔	60 97	1 42	25·46	4·54	19 01
67 13	7 69	74 82	1,454	9,600	3,667½	3,499	4⅔	50 52	1 25	22·53	7·43	24 30
70 72	8 88	79 60	1,566	9,480	3,622½	3,499	4⅔	51 64	1 11	21·90	8·10	27 97
29 93	3 95	33 88	1,319	14,420	5,407½	3,499	4⅔	59 56	2 88	59·70	-29·70	-25 68
68 24	8 10	76 34	1,466	8,960	3,427½	3,499	4⅔	49 19	1 15	21·62	8·38	27 15
55 19	7 46	62 56	1,404	8,480	3,247½	3,499	4⅔	47 30	1 21	25·71	4·20	15 35

Nappan.

DATA *re* Cost of second cross Ayrshire heifers and first cross Guernsey heifers from birth to 1 year of age.

Name.	Period.	Whole Milk.	Skim-milk.	Meal	Roots or Ensilage.	Hay.	Green Feed.	Molasses.	Total Cost.
		Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	$ cts.
Myrtle 1 A 1	Nov. 11, 1913, to Nov. 11, 1914	560	2,800	468	2,696	914	1,320	124	28 93
Jessie 1 A 1	Nov. 14, 1913, to Nov. 14, 1914	560	2,740	477	2,786	923	1,320	124	29 17
Queen 1 A 1	Dec. 6, 1913, to Dec. 6, 1914	510	2,900	535½	3,610	999	1,320	124	30 22
Lessie 1 A 1	Jan. 7, 1914, to Jan. 7, 1915	520	2,260	631	4,570	1,089	1,320	124	33 04
Jean 1 A 1	Feb. 22, 1914, to Feb. 22, 1915	540	2,000	644	5,450	1,227	1,320	124	35 02
Ella 1 G	Dec. 17, 1913, to Dec. 17, 1914	520	2,600	573¾	3,880	1,032	1,320	124	31 33
Queen 1 G	Jan. 1, 1914, to Jan. 1, 1915	520	2,400	615	4,390	1,071	1,320	124	32 58
Jean 1 G	April 8, 1914, to April 8, 1915	620	1,800	600	5,950	874	1,320	124	35 01

Note that the average cost to raise the six first-cross Holstein heifer calves from birth to 1 year of age during 1913-14 was $30.36 per head; that the average cost to raise the five second-cross Ayrshire calves from birth to 1 year of age during 1914-15 was $31.28 per head; and that the average cost to raise the three first-cross Guernsey heifer calves from birth to 1 year of age during 1914-15 was $32.97 per head. The slightly higher cost in the last two instances is no doubt due a great deal to the higher cost of feed this year.

NAPPAN.

DATA *re* cost of Holstein heifers from the time they were yearlings until they dropped their first calf.

Name.	Period.	Meal.	Roots or Ensilage.	Hay.	Pasture.	Total Cost.
		Lb.	Lb.	Lb.	Days.	$ cts.
Mossy 1 H.......	Dec. 6, 1913, to March 15, 1915.	723	9,820	4,365	85	40 92
Vera 1 H.........	Dec. 27, 1913, to April 19, 1915.	730	9,830	4,755	85	42 60
Jessie 1 H........	Dec. 19, 1913, to Feb. 6, 1915.	600	8,100	3,770	85	34 98
Spot 1 H.........	Jan. 14, 1914, to April 25, 1915.	660	9,630	4,750	85	41 33
Bell 1 H.........	Jan. 24, 1914, to Jan. 28, 1915.	476	6,600	3,235	85	29 48
Myrtle 1 H......	Feb. 1, 1914, to March 21, 1915.	564	8,040	3,960	85	35 14

Note that the average cost to raise the eight first-cross Ayrshire heifers from yearlings until they dropped their first calf during 1913-14 was $34.25 per head; and that the average cost to raise the six first-cross Holstein heifers from yearlings until they dropped their first calf during 1914-15 was $37.41 per head. The high cost of production in the latter case is doubtless partly due to the high cost of feed and partly due to individuality

NAPPAN.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. S. BLAIR.

SHORTHORN CATTLE.

As reported last year, the herd at this Station is entirely Shorthorn of Scotch foundation blood, which were selected as representing a good type of farmer's Shorthorns, showing indications of fair milk production, combined with good beef conformation. The herd is not of the dairy Shorthorn breeding, but will be considered from the dairy standpoint. A Shorthorn bull from a good milking strain, but with good beef points, heads the herd, the object being to produce a good beef type of Shorthorn which will give a reasonable flow of milk.

It will be seen from the tabulated data given below that some of the cows compare favourably with good individuals in the milking breeds from a dairy standpoint, and the fact that some of the cows are not profitable milk-producers will give an opportunity to determine the influence of the sire in building up a profitable dairy herd with such cows. It might be stated that the cows are bred as soon as possible after calving.

During the year, one yearling bull has been disposed of for breeding purposes. The stock now consists of seven milch cows, four yearling heifers, three heifer calves, and five bull calves and the herd bull, or a total of twenty head.

The milk from each cow is weighed at each milking, and the butter-fat determined from samples taken weekly.

WINTER FEEDING RATION.

The daily winter ration per cow was as follows:—

	Pounds.
Hay	16
Turnips	60
Corn ensilage	50
Meal mixture 1 pound to 3 pounds milk produced.	

The meal mixture was made up of and cost as follows:—

Wheat bran	400 pounds	at $1.27	$ 5 08
Cotton-seed meal	150 "	1.85	2 77
Oilcake meal	100 "	1.90	1 90
Middlings	150 "	1.65	2 47
Crushed oats	200 "	1.50	3 00
Total	1,000		$ 15 22

One pound of salt was put into the above mixture per 100 pounds when ready for mixing. The cows were fed turnips during the first part of the winter period to February 1, and corn ensilage from that time on.

HOW FED.

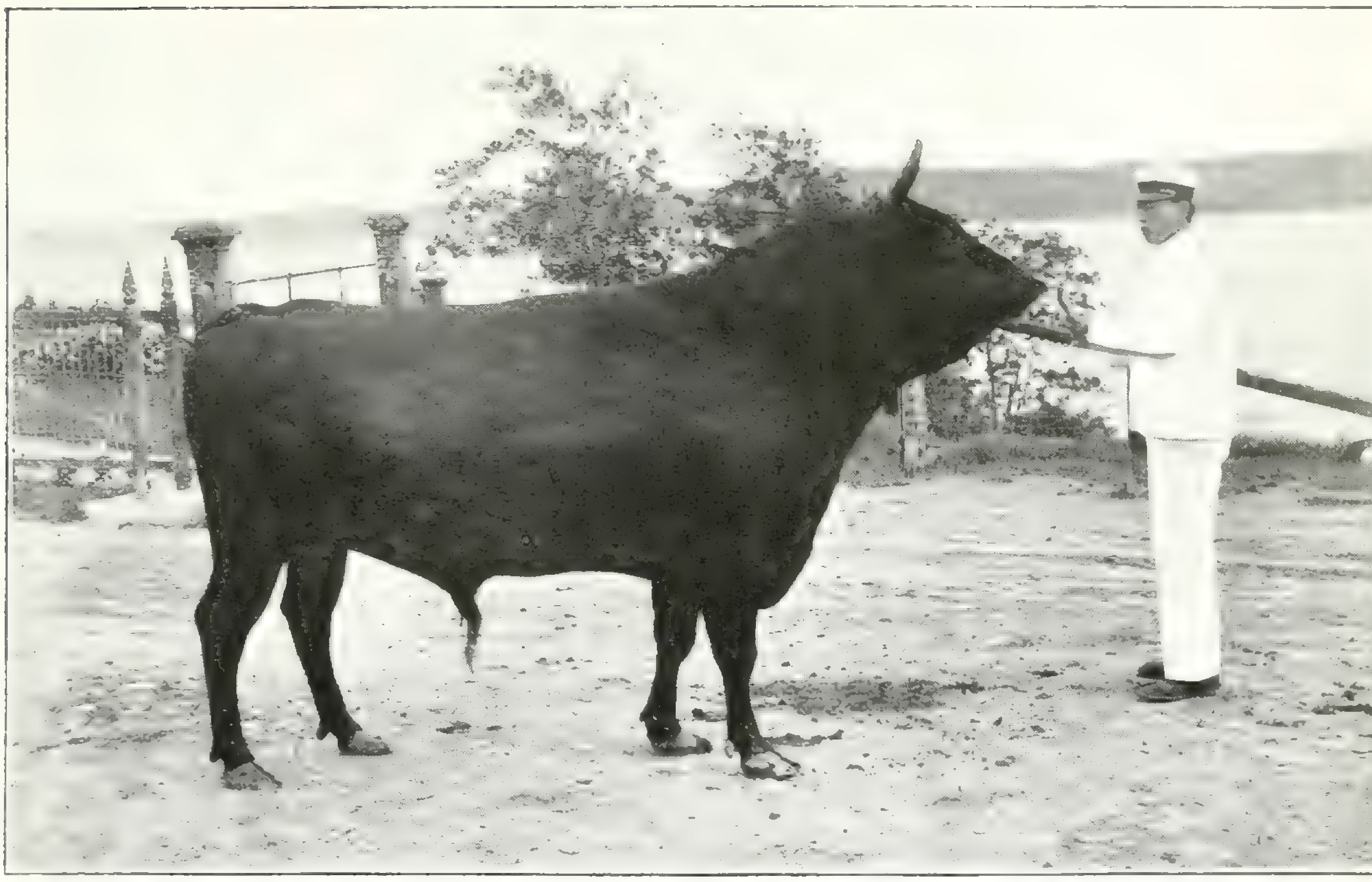
The roots or ensilage is fed in the morning, immediately after milking, and the grain mixture is fed at the same time by scattering it on the feed. After this is eaten a feed of hay is given. At 4 o'clock in the afternoon the same mixture as given in the

Cattle Barn, Central Experimental Farm, Ottawa. One of the Ayrshire rows. Note cattle ties and the comfort of animals. Also note the light and the over head pipes for milking machines.

Calf Barn, Central Experimental Farm, Ottawa. Note the open fronts and pens, guard rails, to protect calves; mangers; light and ventilation.

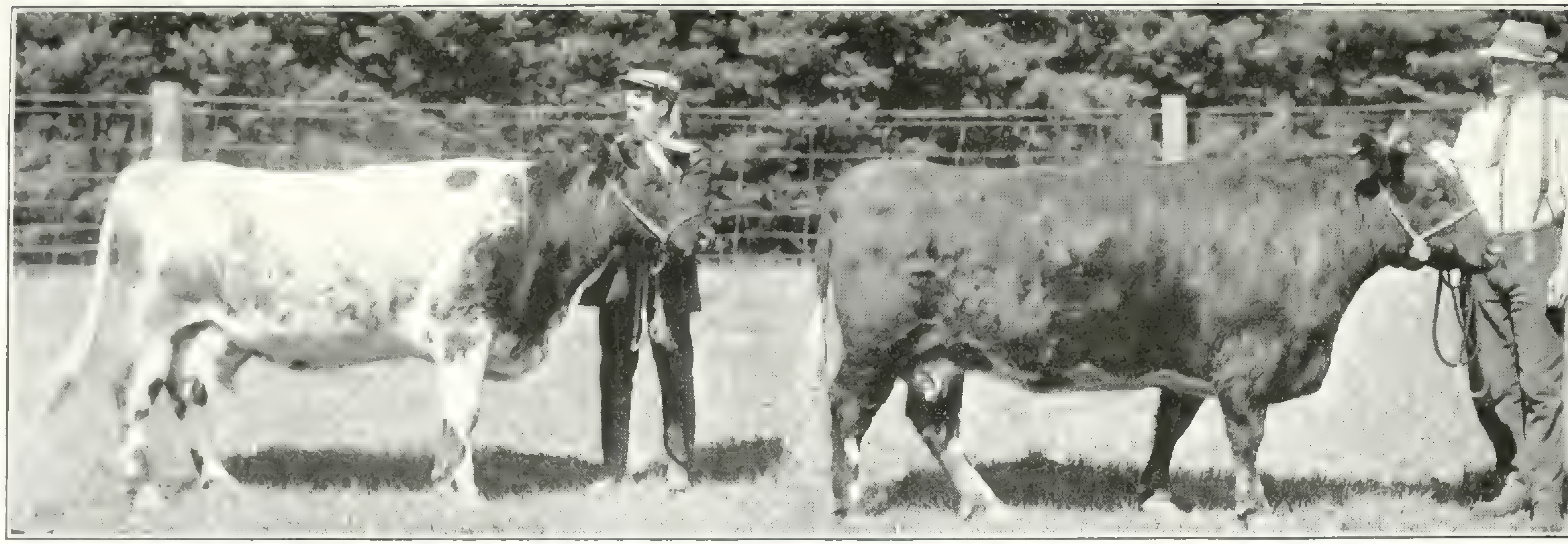
Bull Barn, Central Experimental Farm, Ottawa. Note open fronts to pens and well lighted passage.

Cow Barn, Central Experimental Farm, Ottawa. Main passage. Note the fresh air intakes near wall.



Denis Lord—1539—French Canadian bull at head of herd, Experimental Station, Cap Rouge, P.Q.

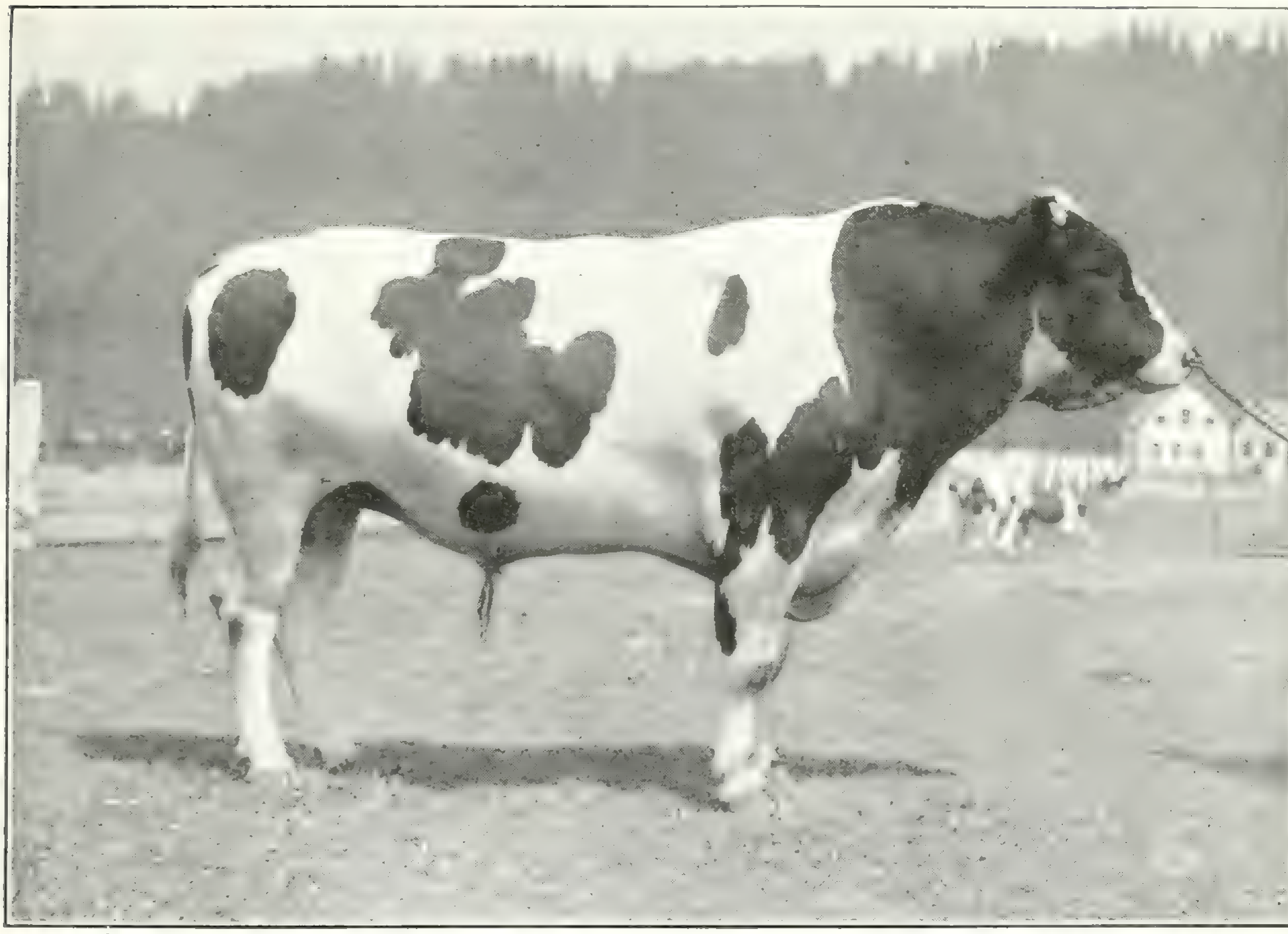
Dairy Type Steers: good feeder on left, poor feeder on right. Experimental Station, Charlottetown, P.E.I.



Brandon : Two Shorthorn cows, illustrating Dual-purpose and Beef type. The one on the left produced in one milking period 12,800 lbs. of milk at a profit of $97.75 ; during the same time the one on the right produced 4,145 lbs. of milk at a loss of $11.55. (The value of the calf and the manure and the cost of labor are not counted in either case.)

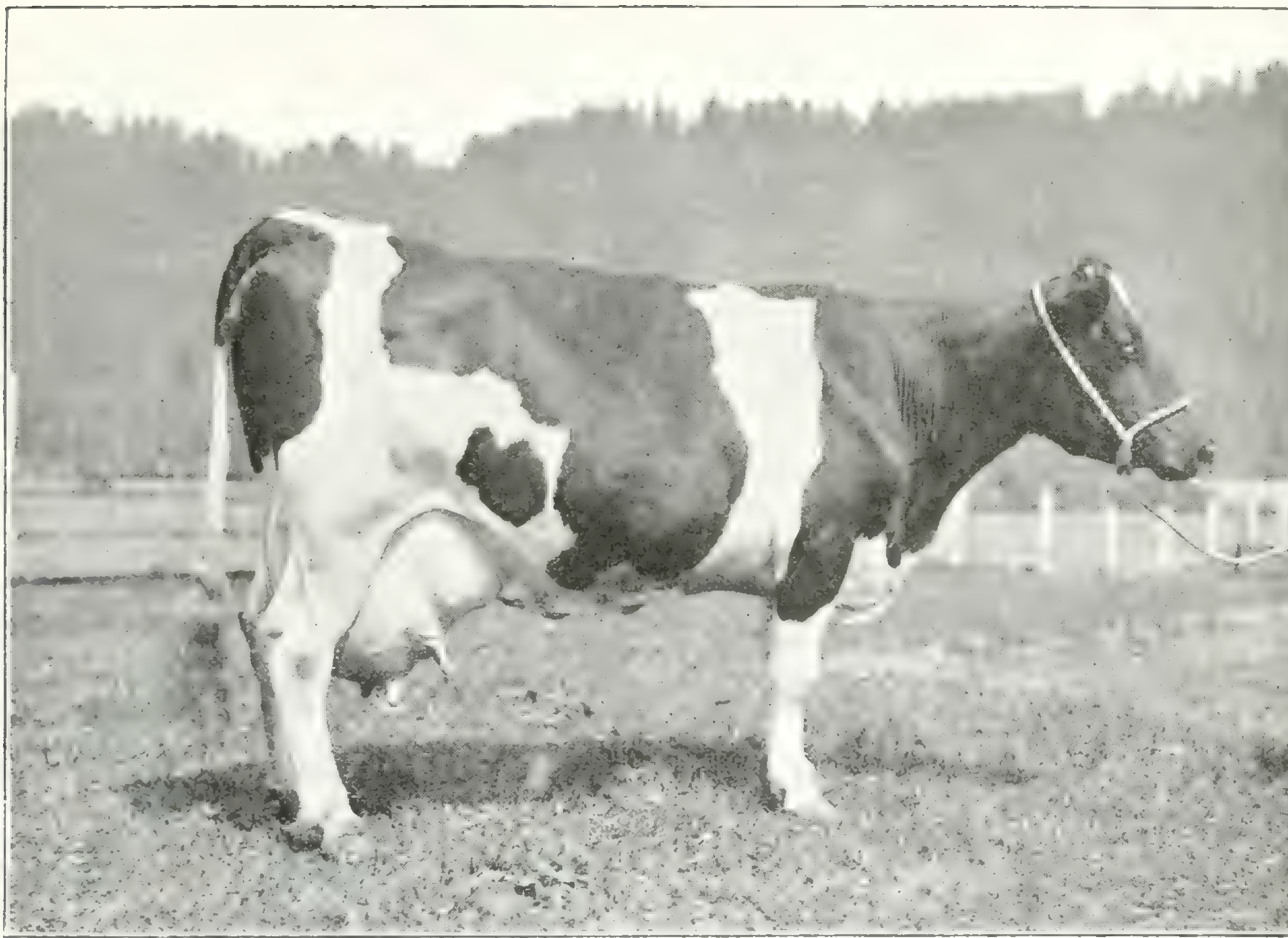
Brandon : Group of Dual-Purpose Shorthorns, headed by Butterfly King 21st. Each of the four cows has given over 9,500 lbs. of milk in 12 months.

Dairy herd at pasture. Lacombe, Alta.



Agassiz, B.C. Sir Natoye Korndyke—13540—Herd Bull. At 3 years 10 months of age weighs 2414 lbs.

Agassiz, B.C. B. C. Korndyke choice—18994—junior herd bull. At 15 months of age weighs 1240 lbs.



Agassiz, B.C. No. 17.--One of the best foundation grade cows.

Agassiz, B.C. Cow No. 22 and her progeny since 1912.
From left to right: No. 22; Daughter No. 35; (Daughter No. 64); No. 55; No. 63; No. 76.

Agassiz, B.C. Cow No. 16 and her female progeny, since 1912.
From left to right: No. 16, Daughter No. 31 grand-daughter No. 59, No. 55, No. 73.

Agassiz, B.C. Cow No. 1 and her progeny since 1912.
Left—Cow No. 14, Daughter No. 36, Grand-daughter No. 71, Daughters Nos. 47 and 67.

morning is repeated, the hay being given after the milking is done. Water is before the cattle all the time. The roots are pulped before feeding.

The dry cows are fed 5 pounds of grain per day for several weeks before freshening. The grain ration consists of 300 pounds bran, 200 pounds oil-meal, 100 pounds ground oats.

SUMMER FEEDING.

The pasturage is limited and not of good quality, and the cows were fed during the summer with a grain mixture of 1 pound grain for every 4 pounds milk given. The summer grain ration was made up of the different feeds as used for winter feeding, mixed in the same proportions.

DRY COWS.

When dry, the cows are fed the regular ration of hay and ensilage or roots, and a small ration of grain made up of 300 pounds bran, 200 pounds oil meal, and 100 pounds crushed oats.

RECORD of Dairy Herd, KENTVILLE.

Name of cow.	Age.	Date of dropping calf.	Number of days in lactation period.	Total pounds of milk for period.	Daily average yield of milk.	Average per cent of fat in milk.	Pounds of butter produced in period.	Value of butter, at 30 cts. per pound.	Value of skim-milk, at 20 cts. per hundred pounds.
	Years		Dys.	Lb.	Lb.	p.c.	Lb.	$ cts.	$ cts.
Hillview Victoria	7	March 5, 1914	265	6,160·25	23·24	4·02	288·91	86 67	11·82
Stamford Countess 10th	6	May 15, 1914	280	7,053·25	25·19	4·12	239·02	101 70	13·52
Meadow Princess	5	Oct. 26, 1913	306	5,290·25	17·28	4·09	252·43	75 72	10·14
Meadow Maid	5	March 11, 1914	259	4,122·25	15·91	3·92	188·52	56 55	7·92
Louisa May 2nd	5	May 29, 1914	167	2,376·25	14·22	3·86	107·01	32 10	4·56
Burnbrae Fairy	3	Oct. 8, 1913	314	2,890·00	9·02	4·06	155·09	46 52	5·51
Meadow Blossom	5	Nov. 16, 1913	261	2,749·75	10·53	4·00	128·32	38 49	5·27
Average of 7 head			264	4,377·42	16·51	3·96	208·48	62 54	8·39

Experimental Station, Kentville, N.S.

Total value of product.	Amount of meal eaten, at 1½ cts. per pound.	Amount of roots and ensilage eaten, at $2 per ton.	Amount of hay eaten, at $10 per ton.	Months on pasture, at $1 per month.	Total cost of feed for period.	Cost to produce 100 pounds milk.	Cost to produce 1 pound butter, skim-milk not included.	Profit or loss on 1 pound butter, skim-milk not included.	Profit or loss on cow during period, labour and calf not included.
$ cts.	Lb.	Lb.	Lb.	Mos.	$ cts.	cts.	cts.	cts.	$ cts.
98·49	1,794	12,000	3,840	4	62 11	100·8	21·49	8·51	36 38
115·22	2,112	12,000	3,840	4	66 88	94·8	19·07	10·30	48 34
85·86	1,620	12,000	3,840	4	59 50	112·4	23·57	6·43	26 36
64·47	1,158	12,000	3,840	4	52 57	127·5	27·88	2·12	11 90
36·66	656	12,000	3,840	4	45 04	189·5	42·08	−12·08	−8 38
52·03	921	12,000	3,840	4	49 01	169·5	31·60	−1·60	3 03
43·76	879	12,000	3,840	4	48 33	175·9	37·70	−7·70	−4 62
70·93	1,305	12,000	3,840	4	54 73	138·6	29·14	0·57	16 14

REARING OF YOUNG STOCK.

CALVES.

The calf is left with the mother two or three days after it is born, when it is removed and fed on 3 to 4 pounds of whole milk three times per day until 3 weeks old. It is then gradually put on to skim-milk, which feed is continued and increased gradually as the calf grows, but the amount given per day does not at any time exceed 20 pounds. The calf is taught to eat meal when the change is made from whole to skim-milk, beginning with a very small quantity and increasing according to the age. The meal ration is made up of three parts bran, two parts oil-meal, and one part crushed oats. Hay is given at an early age, in quantities that can be eaten up nicely in a short time. Roots or small potatoes are fed also, in small quantities at the start, gradually increasing. The calves are kept in box stalls and allowed to run out during warm days for exercise. All pails used are washed clean after each feeding, and scalded out every day. So far there have been no bowel troubles in calves fed as indicated above.

YEARLINGS.

Yearlings are turned on to pasture during the summer, stabled early in the fall and fed hay and ensilage or roots. From 3 to 5 pounds of mixed grain of the same proportions as used for the calves are fed with the roots or ensilage. Exercise is given in the yard once a day if weather permits. Yearlings fed during the winter on a ration of 8 pounds hay, 30 pounds turnips or 20 pounds ensilage, and 3 to 5 pounds grain per day have made an average gain of 50 pounds per month, at a cost of \$3.75 per month or 7½ cents for each pound in weight gained. Care is taken to keep pens, stalls, and mangers clean for the young stock, and all are groomed each day

KENTVILLE.

EXPERIMENTAL STATION, FREDERICTON, N. B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

DAIRY CATTLE.

Complete dairy records at this Station were not started until August last. At the beginning of the year there were but two cows milking. Since then cows have been bought, the dairy building completed, and a start made in regular dairy work.

On the 14th April four pure-bred Holstein females and a bull, four pure-bred dairy Shorthorn females and a bull, and six pure-bred Ayrshire females and a bull were put in, also a grade Holstein and a grade Ayrshire heifer a few months old.

On the 5th of June, seventeen heifers of very mixed breeding, some of which had lately freshened, were bought, which, with three grade cows then on the Farm, made twenty grade cows. One of the grade cows died in June from blood poisoning. These heifers, with the exception of four, all freshened and were bred again to the Holstein bull. They will be used as the foundation of a grading-up experiment. These heifers of mixed breeding, none of them better than the average cows of the province, have been bred to a Holstein bull. The resulting heifer calves will be carefully reared and bred to a Holstein bull, and so on for several generations so that production figures may be obtained from each generation for comparison with the original cows; the object being to show what improvement may be made in dairy production by good care and feed and the use of a pure-bred bull of a dairy herd.

Next year the dairy Shorthorn bull will be used instead of the Holstein, and the year following the Ayrshire bull will be used.

As it was desired to keep up a milk supply during the winter months, ten grade cows of Ayrshire and Jersey breeding were bought in November. These cows freshened in October, November, December and January. Of these, the following table shows the data of production. The feed given was approximately the same to all. The pasture charge was $2 for the season, as five-sixths of the pasture was uncleared land on which no value could be accurately estimated.

FREDERICTON.

RECORD of Dairy Herd, Experimental Station, Fredericton, N.B.

Name.	Date of Freshening	Milking Period at Experimental Station.	Weight Milk.	Per cent Butter-fat.	Pounds Butter.	Pounds Skim-milk.	Value of Butter at 28 cents per pound.	Value of Skim-milk at 20 cts per 100 pounds.	Value of Calf at birth.	Cost per 100 pounds Milk.	Cost per pound Butter.	Total Value of Products.	Approximate cost of Feed.	Profit.	Loss.
		Days.	lb.	p. c.	lb.	lb.	$ cts.	$ cts.	$ cts.	$ cts.	cts.	$ cts.	$ cts.	$ cts.	$ cts.
Bessie G.	May 7, 1914	205	4,481·0	4·3	221·4	4,259·6	61 99	8 51	2 00	1 65	17·4	72 50	47 10	25 40	
Daisy G.	Feb. 17, 1914	236	4,318·4	4·3	213·5	4,104·9	59 78	8 20	2 00	1 24	21·4	69 98	53 92	16 06	
Blossom G.	April 16, 1914	309	6,402·0	4·4	323·9	6,078·1	90 69	12 15	2 00	1 09	17·8	104 84	69 98	34 86	
Pansy A.	July 22, 1914	250	8,344·7	3·7	354·9	7,989·8	99 37	15 97	25 00	0 65	11·0	140 34	55 00	85 34	
Dawn A.	Oct. 23, 1914	160	4,125·2	4·3	204·0	3,921·2	57 12	7 84	25 00	0 85	13·4	89 96	35 20	54 76	
Helen K. H.	Feb. 15, 1914	254	4,215·6	4·0	193·9	4,021·7	54 29	8 04	50 00	1 37	25·7	112 33	57 88	54 45	
RueBell H.	Jan. 17, 1914	288	6,440·0	3·6	266·6	6,173·4	74 64	12 34	50 00	1 01	19·8	136 98	65.36	71 62	
Pietertje H.	Feb. 21, 1914	260	6,236·2	3·6	258·1	5,978·1	72 26	11 95	50 00	0 95	18·3	134 21	59 20	75 01	
Nettie S.	Jan. 9, 1914	274	3,978·2	3·6	164·6	3,813·6	46 08	7 62	50 00	1 56	33·2	103 70	62 28	41 42	
Spot G.	May 1, 1914	194	2,680·8	4·3	132·4	2,548·4	37 07	5 09	2 00	1 53	20·9	44 16	42 68	1 48	
Jilt S.	May 29, 1914	307	9,005·5	3·8	336·0	8,039·5	94 08	17 33	50 00	0 77	15·5	161 41	69 54	91 87	
Hannah G.	April 4, 1914	256	3,671·1	3·5	147·7	3,523·4	41 35	7 04	2 00	1 59	34·7	50 39	58 32	....	7 93
Tiny G.	May 25, 1914	302	3,429·8	4·0	157·7	3,272·1	44 15	6 54	2 00	1 96	38·6	52 69	67 35	....	14 66
Muley G.	May 20, 1914	302	5,354·6	5·0	307·0	5,047·6	85 96	10 09	2 00	1 25	18·6	98 05	67 35	30 70	
Brindle G.	May 20, 1914	302	4,393·0	5·2	262·7	4,130·3	73 55	8 26	2 00	1 53	22·4	83 81	67 35	16 46	
Julia G.	Mar. 1, 1914	243	3,223·5	4·3	177·9	3,064·1	49 81	6 12	2 00	1 72	27·7	57 93	55 46	2 47	
Nelly G.	May 20, 1914	302	3,950·1	4·0	181·7	3,768·4	50 87	7 53	2 00	1 70	32·9	60 40	67 35	....	6 95
Jersey G.	Sept. 1, 1913	130	2,413·4	5·1	141·5	2,271·9	39 62	4 54	2 00	1 16	16·5	46 16	28 00	18 16	
Sally G.	Mar. 31, 1914	103	1,108·9	4·3	54·8	1,054·1	15 34	2 10	2 00	2 04	37·5	19 44	22 66	....	3 22
Kate G.	Mar. 30, 1914	281	3,902·1	4·5	201·9	3,700·2	56 53	7 40	2 00	1 63	28·0	65 93	63 82	2 11	
Madge G.	Aug. 27, 1913	238	3,856·3	4·4	195 1	3,661·2	54 62	7 32	2 00	1 41	24·1	63 94	54 36	9 58	
Alma G.	Aug. 1, 1914	243	3,486·8	4·8	192·4	3,294·4	53 87	6 58	2 00	1 56	24·9	62 45	54 58	7 87	
Twilight A.	Sept. 11, 1914	202	3,557·9	4·2	171·8	3,386·1	48 10	6 77	25 00	1 25	21·9	79 87	44 44	35 43	
Mary G.	Nov. 10, 1914	130	2,716·6	4·2	134·3	2,582·3	37 60	5 16	2 00	1 03	17·0	44 76	28 00	16 76	
Maggie G.	Aug. 28, 1913	130	2,403·1	4·5	124·3	2,278·8	34 80	4 55	2 00	1 16	18·9	41 35	28 00	13 35	
Dolly G.	Aug. 30, 1913	120	3,019·8	4·6	159·7	2,850·1	44 71	5 70	2 00	0 87	12·9	52 41	26 40	26 01	
Betty G.	Dec. 6, 1914	113	2,875·1	4·1	117·8	2,757·3	32 98	5 51	2 00	0 86	16·4	40 49	24 86	15 63	
Zath G.	Dec. 18, 1914	101	2,175·0	5·1	110·9	2,064·1	31 05	4 12	2 00	1 02	16·3	37 17	22 22	14 95	

CALF FEEDING EXPERIMENT.

The object of this experiment was to compare whole milk with substitutes with and without skim-milk, and to compare a home-made grain ration with a prepared calf meal commonly found on the market.

Sixteen grade calves of Ayrshire, Holstein, and Jersey breeding were bought as opportunity offered. It was found impossible to secure all heifer calves, and to get more than sixteen, and they varied in age so that the experiment could not date from time of birth. Calves dropped in December and January were taken, the bulls had to be castrated, and it was the 1st of March before enough calves were in condition to start the experiment. Each pen was made up of calves showing Holstein, Ayrshire, and Jersey breeding. One Holstein, one Jersey, and two Ayrshires were put in each pen. In pen III the Holstein calf became ruptured and had to be taken out. The figures following are for the month of March only. The experiment will be continued until June 1.

RATIONS for Month of March.

Pen.	No. of Calves.	Skim-milk.	Whole Milk.	Meal.	Hay and Ensilage.
I.	4	None.	6 to 20 lb. as needed.	None.	As required.
II.	4	10 to 20 lb.	None.	Oats 2 parts; corn, 4 parts, flax, 1 part (all ground)	" "
III.	3	None.	None.	Calf meal with water	" "
IV.	4	10 to 20 lb.	None.	Calf meal with skim-milk	" "

Ensilage and hay were fed as demanded by the appetite of the calves.

Object of Experiment.—Comparison of milk and substitutes. Values of feeds per ton: Oats, $40; cornmeal, $38; oilcake, $40; Blatchford's calf meal, $80; whole milk $28; skim-milk, $4; ensilage, $3; hay, $10.

FREDERICTON.

CALF FEEDING EXPERIMENT.

		Lot 1.	Lot 2.	Lot 3.	Lot 4.
Number of calves in test	Lb.	4	4	3	4
Total weight at beginning of experiment	"	585	668	482	6[illegible]
Average weight at beginning of experiment	"	146·25	167	160·66	151·75
Total weight at end of one month	"	822	868	563	806
Average weight at end of one month	"	205·5	217	187·66	201·5
Total gain per lot	"	237	200	81	199
Average gain per calf	"	59·25	50	27	49·75
Average gain per calf per day	"	1·91	1·61	·87	1·60
Total meal consumed	"	....	82	231	168
Total whole milk consumed per lot	"	1,512	....	....	....
Total skim-milk consumed per lot	"	....	1,568	....	1,540
Total hay consumed per lot	"	184	184	138	184
Total roots and silage	"	56	56	42	56
Cost of meal fed per lot	$	....	1·56	9·24	6·72
Cost of meal fed per head	"	....	·39	3·08	1·68
Cost of meal fed per head per day	cts.	....	1·25	9·93	5·42
Cost of whole milk fed per lot	$	21·17	....	....	....
Cost of skim-milk per head per day	"	....	3·12	....	3·08
Total cost of feed per head	"	5·54	1·42	3·33	2·70
Total cost of feed per head per day	cts.	17·87	4·58	10·74	8·70
Total cost to produce 1 pound gain	"	9·32	2·84	12·33	5·42
Profit over whole milk ration in producing 1 lb. gain	"	....	6·48	*	3·90
Nutritive ratio of total ration	Lb.	1:4·62	1:3·75	1:3·06	1:3·12
Nutritive ratio of meal ration	"	....	1:6·04	1:3·06	1:3·06
Pounds dry matter to produce 1 pound gain	"	1·55	1·97	4·18	2·36
Pounds of digestible matter to produce 1 pound gain	"	1·47	1·47	2·97	1·78
Pounds of meal matter to produce 1 pound gain	"	None.	4·10	2·85	·84
Pounds of whole milk to produce 1 pound gain	"	6·38	None.	None.	None.
Pounds of skim-milk to produce 1 pound gain	"	None.	7·84	None.	7·73

*In this pen there was a loss in comparison with the whole-milk ration of 3·01 cents in producing one pound of gain.

FREDERICTON.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

DAIRY CATTLE.

The Ayrshire herd at this Station comprises one good bull and twelve milch cows, three yearling heifers and four heifer calves, all registered. There are also six bull calves, which will be sold for breeding purposes if they develop the qualities hoped for.

In the spring of 1914, sixteen young cows of common breeding were purchased to make a start in a grading experiment to be conducted at this Station. Three-year-old cows, newly freshened, were chosen, and these were bred shortly afterwards to the pure-bred Ayrshire herd bull. All the female progeny of these cows will be kept, and the cows will be sold as soon as each has left two heifer calves. These will in turn be bred to a pure-bred bull of the same breed as their sire, and so on for future generations. The purpose of this experiment is to obtain information as to the value of using a pure-bred sire in a herd of common breeding, as seen by the improvement in the first cross over their dams, and the improvement of the stock at different stages of the successive crossing.

All these heifers came from the common herds of the district, and in appearance and colour they well represent the type of cows which comprise the great majority of the herds in this locality, but as far as their milking qualities are concerned they may, perhaps, be slightly below the average.

Below are given a few figures as to their production and the cost of maintenance for their lactation period:—

RECORDS of Grade Herd.

Name of Cow.	No. of days in milk.	Total pounds of milk produced.	Average yield of milk per day.	Total cost of Feed	Value of Milk at $1.60 per hundred pounds.	Profit on cow.
	Dys.	Lb.	Lb.	$ cts.	$ cts.	$ cts.
A	281	3,243	11·54	29 26	51 89	22 63
B	281	3,620	12·88	30 02	57 92	27 90
C	312	3,892	12·47	33 51	62 27	28 76
D	281	3,853	13·71	33 07	61 65	28 58
E	312	3,950	12·66	31 61	63 20	31 59
F	312	4,700	15·06	32 74	75 20	42 46
G	120	864	7·2	11 53	13 83	2 30
H	268	3,333	12·43	26 88	53 33	26 45
I	253	2,331	9·21	20 87	37 29	16 42
J	277	2,559	9·21	24 38	40 80	16 42
K	291	2,744	9·43	28 81	43 91	15 10
L	312	3,917	12·55	32 20	62 67	30 47
M	252	2,631	10·44	28 79	42 09	13 30
N	312	3,749	12·01	32 63	59 98	27 35
O	299	4,030	13·68	32 49	65 44	32 95
P	312	3,499	11·22	31 05	55 99	24 94

Following is a list of the feeds consumed by these sixteen cows during their lactation period:—

Grain (wheat bran, 80 per cent; shorts or middlings, 9 per cent; oil cake meal, 11 per cent, fed dry or with ensilage), 19,844 pounds at 1¼ cents per pound..	$ 248 05
Roots or ensilage, 53,590 pounds at $2 per ton..	53 59
Mixed hay, 19,246 pounds at $7 per ton..	67 36
Oat straw, 9,420 pounds at $4 per ton..	18 84
Pasture, 4½ months each at $1 per month..	72 00
Total cost of feed..	$ 459 84

It is, of course, impossible to judge the relative values of the cows in a herd unless all are in the same condition and receiving the same care throughout their whole lactation period, which was not the case with the above cows. They were all brought to this Station on the same day, but their dates of calving differed considerably. One had calved in January, one in March, twelve in April, and two in May; consequently there is not one complete lactation period in the herd.

These cows, coming from different sections of the district, were all submitted to the tuberculin test, and every one passed. This would seem to indicate that tuberculosis is not as prevalent in this locality as it is supposed to be.

Owing to the lack of weighing appliances, it was impossible to ascertain the weights of these animals before August 5. The average weights on August 5, November 5, and March 5 were as follows: August 5, 869 pounds; November 5, 956 pounds; March 5, 1,012 pounds.

As these cows are only 4 years of age, there is every reason to believe that their weight will be increased still more by their natural growth. It is also hoped that this herd will increase largely in production, and consequently in profit. Their average milk production, returns, cost of feed, and profit per cow are as follows:—

Average milk produced by each cow..	Lb.	3,310
" returns from each cow..	$	52 96
" cost of feed..	"	28 74
" profit per cow..	"	24 22

Only seven of the Ayrshire cows finished a complete lactation period during the past year. The average milk production, returns, cost of feed, and profit per cow for these cows are as follows:—

Average milk produced by each cow..	Lb.	7,555
" returns from each cow..	$	120 87
" cost of feed..	"	53 30
" profit per cow..	"	67 57

Their detailed records for the past year are as follows:—

RECORDS of Pure-bred Herd.

Name of Cow.	No. of days in milk.	Total pounds of milk produced.	Average yield of milk per day.	Total cost of feed	Value of milk at $1.60 per hundred pounds.	Profit on cow.
		Lb.	Lb.	$ cts.	$ cts.	$ cts.
Marjorie 2nd	430	9,946	23·13	74 46	159 13	84 67
Soney 3rd	309	7,405	23·96	40 85	118 48	77 63
Flavia's Girl	350	7,705	22·01	53 54	123 28	69 74
Marjorie 4th	364	7,222	19·84	50 25	115 55	65 30
Flavia's Spot	390	7,464	19·13	52 90	119 42	66 52
Denty 3rd's Own	395	7,670	19·42	56 38	122 72	66 34
Duchess Flavia	357	5,470	15·32	44 71	87 52	42 81

STE. ANNE DE LA POCATIÈRE.

The following foodstuffs were consumed by these seven cows during their lactation period:—

Grain mixture, 17,248 pounds at 1¼ cents per pound..	$ 215 60
Mixed hay, 17,823 pounds at $7 per ton..	62 38
Roots and ensilage, 46,858 pounds at $2 per ton..	46 86
Oat straw, 8,375 pounds at $4 per ton..	16 75
Pasture, 4½ months each at $1 per month..	31 50
Total cost of feed..	$ 373 09

NOTE.—The green feed (peas and oats) given to these cows is valued at the same price as the ensilage, namely, $2 per ton.

Attention is drawn to the fact that the last three cows in the above table are heifers with their first calf; consequently part of the feeds consumed would be required for the development of these animals, besides maintenance and the production of milk. This would naturally decrease the profit from these cows to quite an appreciable extent.

Considering the unfavourable housing conditions at the start of the lactation period, and the fact that the cows were transferred to the new stables in March, 1914, the returns are quite satisfactory. The average cost of producing milk in each herd is as follows:—

Ayrshire herd..	70·5 cents per hundred pounds.
Grade herd..	86·8 " "

COST of Rearing Three Bull Calves Sold as Breeding Sires during the Year.

"Domo de Ste. Anne," sold at 223 days of age.

Whole milk, 1,180 pounds at $1.60 per hundred pounds..	$ 18 88
Grain mixture, 516 pounds at 1¼ cent per pound..	6 45
Clover hay, 582 pounds at $7 per ton..	2 04
Roots and ensilage, 620 pounds at $2 per ton..	62
Flaxseed, 26 pounds at 4 cents per pound..	1 04
Total cost of feed..	$ 29 03
Selling price..	45 00
Profit above cost of feed..	$ 15 97

"Flavia de Ste. Anne," sold at 297 days of age.

Whole milk, 1,020 pounds at $1.60 per hundred pounds..	$ 16 32
Grain mixture, 496 pounds at 1¼ cents per pound..	6 20
Clover hay, 734 pounds at $7 per ton..	2 57
Roots and ensilage, 820 pounds at $2 per ton..	82
Flaxseed, 23 pounds at 4 cents per pound..	92
Total cost of feed..	$ 26 83
Selling price..	60 00
Profit above cost of feed..	$ 33 17

"Major," sold at 237 days of age.

Whole milk, 1,035 pounds at $1.60 per hundred pounds..	$ 16 56
Grain mixture, 540 pounds at 1¼ cents per pound..	6 75
Clover hay, 950 pounds at $7 per ton..	3 32
Roots and ensilage, 1,250 pounds at $2 per ton..	1 25
Flaxseed, 37 pounds at 4 cents per pound..	1 48
Total cost of feed..	$ 29 36
Selling price..	50 00
Profit above cost of feed..	$ 20 64

STE. ANNE DE LA POCATIÈRE.

COST of rearing Three Heifer Calves from Birth to 12 months of age.

"*Duchesse de Ste. Anne.*"

Whole milk, 1,275 pounds at $1.60 per hundred pounds..	$ 20 10
Grain mixture, 1,369 pounds at 1¼ cents per pound..	17 11
Clover hay, 1,580 pounds at $7 per ton..	5 53
Roots and ensilage, 1,598 pounds at $2 per ton..	1 60
Flaxseed, 35 pounds at 4 cents per pound..	1 40
Pasture, 3 months at $1 per month..	3 00
Total cost of feed..	$ 49 04

"*Flavia de Ste. Anne.*"

Whole milk, 1,125 pounds at $1.60 per hundred pounds..	$ 18 00
Grain mixture, 1,320 pounds at 1¼ cents per pound..	16 50
Clover hay, 1,004 pounds at $7 per ton..	3 52
Roots and ensilage, 1,260 pounds at $2 per ton..	1 26
Flaxseed, 28 pounds at 4 cents per pound..	1 12
Pasture, 3 months at $1 per month..	3 00
Total cost of feed..	$ 43 40

"*Soncy de Ste. Anne.*"

Whole milk, 980 pounds at $1.60 per hundred pounds..	$ 15 68
Grain mixture, 1,064 pounds at 1¼ cents per pound..	13 30
Clover hay, 1,620 pounds at $7 per ton..	5 67
Roots and ensilage, 1,580 pounds at $2 per ton..	1 58
Flaxseed, 28 pounds at 4 cents per pound..	1 12
Pasture, 3 months at $1 per month..	3 00
Total cost of feed..	$ 40 35

At the time these calves were dropped the milk was sold at the price charged above, namely, $1.60 per hundred pounds, owing to the lack of equipment necessary for the separating and manufacturing of the same at this Station. In the feeding of calves, skim-milk replaces whole milk to advantage after the first week, reducing the cost materially. The flaxseed meal was given in the milk, after the third week. One ounce of this meal was fed at the start, replacing 1 pound of milk. The second week 1 ounce replaced 2 pounds of milk, and so on. Five ounces was the maximum given to each calf per day. The grain mixture, composed of crushed oats, wheat bran, and shorts, was fed dry mixed with the roots, starting when the calves were 4 weeks of age.

On March 5, at the ages, respectively, of 13, 14 and 16 months, the weights of these heifers were as follows:—

	Pounds.
"Duchesse de Ste. Anne"..	530
"Flavia de Ste. Anne"..	595
"Soncy de Ste. Anne"..	690

The cost of raising these heifers will be recorded to the date of their first calving.

STE. ANNE DE LA POCATIÈRE.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

DAIRY CATTLE.

The herd now comprises twenty-nine head of pure-bred and ten grade French Canadians. There are four bulls, one aged, a 2-year-old, a yearling, and a calf; eighteen cows; thirteen heifers; and four heifer calves. These cattle are kept to supply milk to the dairy, to sell breeding stock at reasonable figures, and for experimental breeding and feeding.

EXPERIMENTAL BREEDING.

The grades, bred to a registered bull, have produced heifers which are better looking and heavier, on an average, than their dams. These heifers have been bred, most of them, to their sire, and will calve when about 3 years of age. Both the old bull and his daughters were of a strong, rugged constitution, they were all larger than the average for the breed, they had no serious defect in common, and it is expected that these qualities will be intensified by this in-breeding. The herd bull, at Cap Rouge, is acknowledged to be the best of the breed in existence to-day, as far as conformation goes, and he is out of a very good milker. The heifers are out of cows whose milk yield is known, and it will certainly be interesting to watch them during their first period of lactation.

The best registered cow, that will qualify for the Record of Performance with about 3,000 pounds of milk to spare, will be bred to her son, now 2 years old, and which was sired by the old bull. This young bull will be used on the progeny of the heifers which were served by their sire, so that in-breeding will be followed by line breeding.

MILK PRODUCTION.

The following table gives details regarding the cows which finished a period of lactation during the year, that is, between April 1, 1914, and March 31, 1915. In comparing with last year's figures the most noteworthy fact is that the yearly milk production has increased 1,810 pounds and that of butter 59·44 pounds per cow.

RECORD of Dairy Herd Experimental

Name of Cow	Registration No.	Age at beginning of lactation period.	Date of dropping calf	Number of days in lactation period.	Total pounds of milk for period.	Daily average yield of milk.	Average per cent fat in milk.	Pounds of butter produced in period.
		Yrs.		Days.	Lb.	Lb.	p. c.	Lb.
Empire	2395	3	Sept. 5, 1913	437	8,920·75	20·41	4·26	447·51
La Brune du Sable	2440	9	July 18, 1913	583	10,492·25	18·00	4·32	534·02
Finette 2eme	218	8	March 4, 1913	341	8,039·25	23·57	4·00	398·21
Denise Besse	1269	8½	Jan. 15, 1914	304	8,396·25	27·71	3·83	378·94
Princesse du Sable	2261	3	Nov. 13, 1913	368	7,076·50	19·23	4·16	347·05
Nanette de St. Denis	2413	3	Aug. 22, 1913	256	5,974·25	23·34	4·27	300·68
Kate	Grade		April 11, 1913	495	8,279·50	16·72	4·05	394·78
Jeannette de St. Denis	2409	8	June 24, 1913	368	7,563·75	20·55	4·07	362·07
Baronne de St. Denis	2511	8	April 21, 1913	492	7,565·75	15·37	3·90	347·62
Gipsy	Grade		Dec. 30, 1913	323	5,203·75	16·11	3·72	227·85
Exilée de Kamouraska	2414	3	Aug. 11, 1913	338	5,179·25	15·32	4·31	262·64
Hilda	Grade		June 18, 1913	385	6,487·00	16·85	3·58	273·16
Eva	Grade		June 12, 1913	320	5,929·75	18·53	3·79	270·14
Average—13 head				385	7,316·00	19·00	4·06	349·59

CAP ROUGE.

Station, Cap Rouge, Quebec.

Value of butter at 28 cts. per lb.	Value of skim-milk at 20 cts. per cwt.	Total value of product.	Amount of meal eaten, at $1\frac{1}{4}$ cts. per lb.	Amount of roots and ensilage eaten at $2 per ton.	Amount of hay eaten, at $7 per ton.	Amount of green feed eaten, at $1 per ton.	Months on pasture, at $1 per month.	Total cost of feed between calvings.	Cost to produce 100 lb. of milk.	Cost to produce 1 lb. of butter, skim-milk neglected.	Profit on 1 lb. of butter (skim-milk neglected.)	Profit on cow between calvings, labour, manure and calf neglected.
$ cts.	$ cts.	$ cts.	Lb.	Lb.	Lb.	Lb.	Mos.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
125 30	17 08	142 38	2,443	11,314	3,026	7,859		64 26	0·72	0·146	0·14	78 12
149 53	20 07	169 60	4,203	16,094	3,600	8,245	$1\frac{1}{2}$	95 11	0·90	0·178	0·102	74 49
111 50	15 40	126 91	2,269	5,726	2,247	7,290	$1\frac{1}{2}$	54 39	0·67	0·111	0·169	72 52
106 11	16 14	122 25	2,507	10,591	3,104	4,537		59 60	0·709	0·157	0·123	62 65
97 17	13 54	110 71	2,181	10,832	2,945	5,962		57 [illegible]	0·81	0·[illegible]	0·115	53 36
84 19	11 43	95 62	1,737	8,497	1,504	5,616	$\frac{23}{30}$	44 62	0·746	0·148	0·132	51 00
110 54	15 89	126 43	3,147	10,343	3,136	9,339	$1\frac{1}{2}$	76 16	0·87	0·192	0·088	50 27
101 38	14 51	115 89	3,370	9,632	2,462	7,628	$1\frac{1}{2}$	73 31	0·97	0·202	0·078	42 58
97 33	14 54	111 87	3,013	12,093	3,090	7,691	$1\frac{1}{2}$	73 07	0·966	0·21	0·070	38 80
63 79	10 02	73 80	1,556	8,583	2,461	2,925		41 03	0·788	0·18	0·10	32 77
73 54	9 91	83 45	2,130	8,747	2,068	5,665	$1\frac{1}{2}$	52 60	1·015	0·20	0·08	30 85
76 49	12 51	89 00	2,336	11,231	2,992	7,491	$\frac{1}{2}$	63 66	0·981	0·233	0·047	25 34
75 64	11 41	87 05	2,545	11,513	2,969	7,289	$1\frac{1}{2}$	66 15	1·116	0·243	0·037	20 90
97 89	14 04	111 93	2,572	10,399	2,738	6,733	0·9	63 18	0·866	0·18	0·10	48 74

An interesting fact is that the six cows at the head of the list gave a total profit of $392.14 for $375.33 worth of feed consumed, or 104 per cent, whilst the seven at the bottom of the list gave a total profit of $241.51 for $445.98 worth of feed consumed, or 54 per cent. This is telling over again the same old story, that the best cows only should be kept, but it can stand to be told often.

EXPERIMENTAL FEEDING.

The experiment begun last year with nine cows was continued this year with six, to find out the best quantities of meal to be fed. All the cows, which were nearly of the same weight, received exactly the same quantity of roughage, hay, ensilage, swedes; two of them ate as much meal as they could clean, which was about one pound per 2·5 pounds of milk, two others received 1 pound of meal per 4 pounds of milk, and the last two received 1 pound of meal per 8 pounds of milk. The experiment lasted about five months, and great care was taken to weigh all the feed and milk correctly. Partitions were put in the mangers so that a cow could not steal her neighbour's food, and sawdust was used for bedding, so that no straw could be eaten.

The results of the two years, added together, show that the cows which had unlimited quantities of meal gave the most profit. It is proposed to continue the experiment for three years more, when detailed figures of the whole thing can be published.

The food values were calculated as follows: meal $1\frac{1}{4}$ cents per pound; roots and ensilage, $2 per ton; hay, $7 per ton; whilst butter was valued at 28 cents per pound, and skim-milk at 20 cents per cwt. Labour, interest, depreciation, and manure were neglected. This, of course, would not change the relative profits of the different ways of feeding.

COST OF RAISING HEIFERS.

All the feed given to three heifer calves was weighed carefully, as it is the intention to find out how much it costs to raise heifers until they milk. The following table gives details:—

CAP ROUGE.

COST OF RAISING HEIFERS.

Name of Cow.	Register No.	Date of birth.	Weight at birth.	Weight at 6 months	Age March 31.		Feed Eaten.					Cost.
							Whole Milk.	Skim-Milk.	Meal.	Hay.	Roots (Swedes)	
			Lb.	Lb.	Mos.	Days	Lb.	Lb.	Lb.	Lb.	Lb.	$ cts.
Jeannette de Cap Rouge	3,490	Aug. 12, 1914	49	315	7	19	1,098	5,416	151	257	775	27 25
Henriette " "	3,574	Sept. 26, 1914	76	377	6	4	1,065	2,907	101	228	759	24 98
Reine " "	Grade	Oct. 21, 1914	76	391	5	7	922	2,212	97	194	664	21 16
Average	....	....	67	361	6	10	1,028	2,845	116	226	733	24 30

Whole milk was calculated at $1.50 per cwt., skim-milk at 20 cents per cwt., meal at 1¼ cents per pound, hay at $7 per ton, and roots at $3 per ton.

These heifer calves are exceedingly well grown, and the average cost of the feed to bring them to six months was $23.18. It is probable that experiments to be soon undertaken here will show that the cost could have been decreased, and the calves as well grown, with more skim and less whole milk.

SELLING BREEDERS AT A REASONABLE COST.

There are now in the herd nine cows which qualified for Record of Performance, and there can be no doubt that these are proved high-class producers. The male calves of these cows cannot help but improve the herds where they will be used for service. Besides the above mentioned nine cows, all the others, also the heifers, will be required to qualify, or will go to the butcher. This means that only good yielders will be kept; their produce, sold at reasonable prices, will be of more benefit to the farmers of the district than the amount spent to take care of and feed the whole herd. This is so well understood that the Live Stock Breeders' Association of the Province of Quebec, who annually sell a large number of cattle, hogs, and sheep at auction, have reserved every one of the bull calves from cows which have qualified for Record of Performance for an unlimited number of years.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

DUAL-PURPOSE AND DAIRY CATTLE.

The breeding herd at the Brandon Experimental Farm on March 31, 1915, consists of the following:—

Shorthorn: One bull, fifteen milch cows, and twelve heifers and calves.
Ayrshire: One milch cow.

Grade: Two milch cows, 2 calves.

Most of the Shorthorns on this Farm are of the dual-purpose type. They are being bred and fed for the production of milk, as well as for suitability for beef. The average milk production of this herd is improving each year, and the best record this year (12,000 pounds of milk containing 486·3 pounds of butter-fat) would rank as good dairy production in any breed. Six young bulls of this strain were sold to farmers in Western Canada during the year. A great many more could have been sold had they been available.

MILK RECORDS.

The accompanying table shows the milk records for all the cows that finished a milking period during the fiscal year of 1914-15. The records are reported by the lactation period rather than by the calendar or fiscal year. A number of lactation periods are longer than desirable; this is due to delay in conception due to lack of virility in a bull. The feed is counted from the time a cow dries up in milk flow until she dries up again. It is only fair to the cows that show a loss to say that they are purely of beef type and breeding. Several of the others are of similar breeding, but seem to be better able to respond to dairy conditions. In addition to this list, there are some heifers that have not finished their first lactation period, and two older cows that are milking but did not finish a period during the year.

The milk is valued at 1½ cents per pound, as this seems a fair valuation for the West; it was really sold at from 1¾ to 2 cents per pound.

The testing of the milk for butter-fat was commenced on January 1, 1914; consequently the figures on this point are not available for lactation periods that commenced before that date.

BRANDON.

MILK RECORDS.

Name of Cow.		Age at beginning of lactation period.	Date of dropping calf.	Number of days in lactation period.	Total pounds of milk for the period.	Daily average yield of milk.	Average per cent of fat in milk.	Pounds of fat produced in the period.	Value of whole milk, at 1½ cents per pound.	Amount of meal eaten, at 1 cent per pound.	Amount of roots and ensilage eaten, at $3 per ton.	Amount of hay eaten, at $10 per ton.	Amount of green feed eaten, at $3 per ton.	Amount of straw eaten, at $2 per ton.	Months on pasture, at $1 per month.	Total cost of feed between calvings.	Cost to produce 100 pound of milk.	Profit on cow between calvings, labour and calf neglected.
		Yrs.		Dys.	Lb.	Lb.	p.c.	Lb.	$ cts.	Lb.	Lb.	Lb.	Lb.	Lb.	Mos.	$ cts.	Cts.	$ cts.
Ottawa Marchioness 5th	S.	5	Mar. 6, 1914	383	12,800	33·4	3·8	486·3	192 00	4,673	16,764	2,712	182	1,071	4½	91 27	71·3	100 73
Marigold	Grade	2	Jan. 27, 1914	429	10,340	24·1	4·3	444·	155 10	4,340	9,473	2,557	226	1,247	5⅓	77 31	74·7	77 79
Ottawa Janet 4th	S.	3	Mar. 18, 1913	401	8,462⅓	21·1	......	......	126 93	2,347	10,261	1,480	252	1,556	4½	52 69	62·2	74 24
Brandon Marchioness	S.	2	Nov. 25, 1913	492	9,998	20·3	3·75	374·6	149 97	4,723	11,984	2,704	226	1,820	5⅓	86 21	87·2	63 76
Brandon Paeony	S.	2	Oct. 20, 1913	472	9,750½	20·6	......	......	146 25	4,773	11,296	2,341	226	1,499	5½	83 71	85·8	62 54
Daisy of Brandon	S.	8	May 5, 1913	554	7,833½	14·1	......	......	117 57	2,893	9,541	1,579	252	1,345	12	64 85	82·7	52 72
Illuminata 3rd	S.	9	June 3, 1913	345	7,017	20·3	......	......	105 25	2,475	10,881	1,590	252	1,638	4½	55 54	79·1	49 71
Brandon Fairy	A.	2	Sept. 10, 1913	438	7,160	16·3	......	......	107 40	3,508	9,068	1,722	238	1,162	7	65 80	91·9	41 60
Rose of Brandon	S.	10	May 9, 1913	371	6,331½	17·06	......	......	94 97	2,316	10,665	1,594	252	1,659	4½	53 67	84·7	41 30
Brandon Hannah	S.	2	Oct. 8, 1913	446	6,267	14·05	......	......	94 00	3,581	10,406	1,875	226	1,358	5½	67 99	108·4	26 10
Duchess 3rd	S.	6	Jan. 4, 1914	187	4,648	24·8	......	......	69 72	2,467	8,107	1,185	252	1,097	2	46 22	99·4	23 50
Illuminata 4th	S.	7	Oct. 13, 1913	465	5,840	12·5	......	......	87 60	3,343	11,449	1,605	252	1,545	11	71 54	122·5	16 06
Poppy of Brandon	S.	6	April 8, 1914	326	5,796	17·7	4·01	232·7	86 94	3,774	10,108	2,277	......	1,639	5½	71 42	123·2	15 52
Brandon Princess	S.	2	Nov. 7, 1913	348	2,795	8·03	......	......	41 92	2,446	7,948	1,281	238	1,013	5¾	49 89	178·5	Loss 7 97
Brandon Beauty	S.	5	May 12, 1914	276	4,145	15·	3·8	159·3	62 17	3,678	10,050	2,503	252	1,831	7	73 57	177·4	Loss 11 40

WINTER RATIONS FOR DAIRY COWS.

A most important factor in producing milk in the winter is the feed. The following rations were fed to the dairy herd during the past winter with very good results:—

Roughage.—5 pounds mixed hay per day; 5 pounds alfalfa hay per day; 5 pounds oat and barley straw per day; 35 pounds ensilage per day; 10 pounds roots per day.

Meal.—Equal parts oat-chop and bran fed in the proportion of 1 pound of meal to every 3½ or 4 pounds of milk given.

The corn ensilage and the alfalfa are found to be especially valuable in keeping up a good flow of milk during the winter. As a result of the use of these feeds, the average flow of milk is higher in this herd in the winter than in the summer. The growing of these crops, and the building of a silo for the storing of the corn, are strongly recommended to any farmers in Manitoba who are going in for dairying.

COST OF RAISING HEIFERS.

Detailed records have been kept of the feed given to all the calves and heifers, as well as to the milking cows. As a result, data are available in regard to the cost of raising heifers under the conditions which exist here. The three statements that follow show the cost for the first, second, and third year of the animal's life.

Pansy of Brandon—From Birth to 1 Year.

Born April 8, 1914; weight at birth, 75 pounds; weight, March 31, 1915, 634 pounds.

Feed consumed during the year—

290 pounds	whole milk at 1½ cent per pound	$4 35
1,988 "	skim-milk at 20 cents per hundred pounds	3 97
1,475 "	corn silage at $3 per ton	2 21
312 "	straw at $2 per ton	31
287 "	alfalfa at $12 per ton	1 72
510 "	mixed hay at $10 per ton	2 55
890 "	grain at $20 per ton	8 90
	Total cost	$24 01

Brandon Marjory—From 1 Year to 2 Years.

Born March 28, 1913; weight April 1, 1914, 600 pounds; weight, March 31, 1915, 925 pounds.

Feed consumed during the year—

3,750 pounds	silage at $3 per ton	$5 62
664 "	straw at $2 per ton	66
690 "	alfalfa at $12 per ton	4 14
770 "	mixed hay at $10 per ton	3 85
470 "	grain at $20 per ton	4 70
6 months	on pasture at $1 per month	6 00
	Total cost	$24 97

Brandon Marchioness Bess—From 2 to 3 Years.

Born November 20, 1911; weight, November 20, 1913, 1,010 pounds; weight, November 20, 1914, 1,290 pounds.

Feed consumed during the year—

5,532 pounds	silage at $3 per ton	$ 8 30
956 "	straw at $2 per ton	95
380 "	alfalfa at $12 per ton	2 28
812 "	mixed hay at $10 per ton	4 06
567 "	grain at $20 per ton	5 67
6 months	on pasture at $1 per month	6 00
	Total cost	$27 26

BRANDON.

BUILDINGS.

SILO.

A new silo was built this year. It is of solid concrete construction, 16 feet across inside, and 34 feet high. The walls are 9 inches thick and are well reinforced with ⅝-inch iron rods running both vertically and horizontally. The proportions of the ingredients used in making the cement was 1¼ cement to 2 sand and 4 crushed granite. It is believed that a very substantial and durable structure has been the result.

As the old silo, which has been in use on this Farm for several years, is wooden-stave construction above the ground, it will be possible to compare the two types of silo.

ROOT CELLAR.

A commodious root cellar was also built, under ground, in the side of the hill, behind the cattle barn. The outside dimensions are 30 feet by 40 feet, but a feed room comes out of this area. It is built of reinforced cement throughout. The roof is a reinforced concrete slab 6 inches thick. It is supported by reinforced concrete beams and pillars.

ALFALFA SILAGE.

The question is sometimes raised, whether or not alfalfa is suitable for storing in the silo. Results obtained by American investigators show that the pure alfalfa ensilage is not very satisfactory, as disagreeable odours and flavours arise. An experiment was tried this year in storing green alfalfa along with corn. The two were not mixed, but were put in by the wagon-load, in proportion of one load of alfalfa to two of corn. The weight of the corn packed the alfalfa thoroughly, and its juices permeated it so that the alfalfa kept as well as the corn. It came out in excellent condition, and was eaten with great relish by the cattle.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE ASSISTANT TO THE SUPERINTENDENT, K. MacBEAN, B.S.A.

DUAL-PURPOSE CATTLE.

The breeding herd is composed of the following:—

Shorthorns: one bull, one yearling bull, twenty milch cows, two 2-year old heifers, two yearling heifers, eleven heifer calves, five bull calves.

Grades: one cow, one yearling heifer, one bull calf.

There being much demand in Western Canada for cattle of the dual-purpose type, some eighteen months ago the question of breeding a strain of such cattle at this Farm was given careful consideration. The result was that, instead of handling the existing herd of Shorthorns purely on the lines of a beef herd, as had been done in previous years, future work was to entail the development of the milking or dual-purpose Shorthorn.

All the cows, practically, being of beef conformation, it naturally follows that, though the sire at their head is bred from a strain of well-bred milking Shorthorns, some time will elapse before fruitful results are forthcoming. It is, after all, in the progeny of this bull that our expectations lie, whereby, through a rigid process of selection and culling out, hopes are entertained for the building up, by degrees, of a desirable herd of dual-purpose Shorthorns at this Farm.

A quicker means towards this end would be by the installation of a new herd of strictly dual-purpose cattle, but, as this would necessitate considerable outlay, the only alternative is that outlined above.

It is well to note that as this line is one in which the farmers of the Indian Head and surrounding districts are very much interested, no better line of work with cattle could be undertaken at this Farm than the development of a cow that will give a profitable flow of milk and also produce a calf that will develop into a good beef steer.

That this is certainly the cow and the only cow for the average prairie farmer is a fact that should withstand any criticism. His location and distance from market is invariably such that the general purpose cow is the one for him, and not the specialized beef or dairy cow.

The demand for young stock sired by the bull heading the herd at present is all that could be desired, the fact being that the demand far exceeds the supply. Bull calves are spoken for before birth, while inquiries are being continually made for heifers also. Meantime, no females are sold, as it is necessary to retain them in the herd long enough to ascertain whether they may develop into desirable milking Shorthorns or not, while their retention in the herd is also required for its development.

During the past season three young bulls were sold from the Farm, while as many more were asked for but were not available.

Although, in this work, the most expected from the cows is that they may raise heifers conforming to the type desired, yet it may be in place to refer to the lactation record of one or two of the cows to show that some of them are fairly good milkers, though in conformation they are of beef type.

Taking two cows as examples of what constitutes the herd, the following are the results of their last lactation periods:—

Both cows are aged, one being 7 and the other 9 years old. The former, "Prairie Red Rose 4th," milking from January 17 until November 30, 1914, gave a yield of 5,452 pounds of milk with a fat test of 3·7 per cent. The latter, "Rosebud," her lactation period running from January 8 until November 18, 1914, gave 5,219 pounds of milk, also testing 3·7 per cent.

Considering the fact that these cows had not been milked by hand previous to last season, these returns are very satisfactory. It is no exaggeration to state that, if the milking tendency in them had been encouraged at the age of 2½ years, they probably would have developed into very good milkers. It is also worthy of note that the younger of the two will easily beat her last year's record if she continues to keep up to her present standard, as she is milking much better this season than last.

Since it is probable that heifers reared from such cows will be heavier milkers than their dams as long as there is a sire of high quality retained at the head of the herd, it is not too much to conclude that, in process of time, this Farm will be in possession of a very fair type of milking Shorthorn.

By paying the strictest attention and consideration to the development of the dual-purpose Shorthorn at Indian Head, great possibilities are open for doing splendid work towards materially assisting the average prairie farmer.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

DAIRY CATTLE.

There are on hand, at the close of the year, eighteen pure-bred Holstein cattle. A number of the heifers are entered in the Record of Performance test, and two have qualified during the year, with records of 290 and 326 pounds of fat respectively in their 2 year-old form. The heifer "Lawncrest Lee Beets" has finished her lactation period as a 3 year-old, in which she produced over 13,700 pounds of milk.

During the year, the son of "Rosalind of Old Basing"—1714 has been purchased and, should this animal develop and breed as may be expected from the remarkable production of his dam, he will prove a satisfactory head for the Jersey herd.

The cow "Brampton Wolseley Girl" is still producing well.

The work of grading up the common herd by the use of a high-class pure-bred sire is developing in interest and should prove of great importance. The record of this herd of common grades shows that they are capable of producing an average of about 5,200 pounds of milk as fully mature cows. While making this average production they were housed in the same stable and fed equally well in proportion to the amount of milk being produced as was the herd of high-grade Holsteins and the herd of pure-bred Holsteins.

The following table shows the production of each individual in the three herds, fed and housed in the same manner. If the breeding-up test now under way shows a like increase in production, as a result of breeding to pure-bred sires, the experiment will be well worth while, not in the sense of proving anything new, but as an additional demonstration of the advantage of using good blood of the same breed in each successive step in the development of the herd. It should be pointed out that the common grade cows in this test, at the time of making the records given, were fully matured, and the average production reached represents the maximum of which the e cows are capable under favourable conditions as to feed and management.

The high-grade Holsteins came in between the ages of 2 and 3 years old and were not bred to freshen within as short a time as if they had been fully mature. The fact that they were not bred and were milking for a very long lactation period gives them an advantage. On the other hand, they were at a disadvantage in regard to their age.

With one exception the herd of pure-bred Holsteins were heifers, 2 and 3 years old, and the very high daily average production of this herd of heifers, as compared with the daily production of the high-grade herd and the herd of common grades emphasizes the importance of breeding.

Records of Common Grade Cattle at the Dominion Experimental Station, Lacombe.

Name or No. of Cow.	Freshened.	Pounds Milk	Butter-fat.
		Lb.	p.c.
Grade No. 5	March 13, 1914	4,993·9	4·4
" 1	February 8, 1914	6,113·4	3·7
" 7	March 2, 1914	9,814·6	3·8
" 4	May 20, 1914	3,011·3	4·0
" 33	December 24, 1913	4,401·3	3·0
" 34	" 27, 1913	8,349·6	5·7
" 30	July 17, 1914	5,467·0	4·1
" 31	May 2, 1914	4,681·0	3·5
	Average	5,203·6	4·0

Average number of days in lactation period... 322
Average pounds milk per day.................. 16·1

Records of High Grade Holsteins at the Dominion Experimental Station, Lacombe.

No. of Cow.	Freshened.	Pounds Milk.	Butter-fat.
		Lb.	p.c
Grade 11	December 7, 1913	12,255·8	3·4
" 12	April 19, 1913	13,469·2	4·4
" 13	March 31, 1914	8,117·4	3·9
" 14	January 12, 1914	10,065·4	3·6
" 15	December 22, 1913	11,456·2	3·9
" 17	" 11, 1913	9,409·0	4·1
" 18	" 23, 1913	5,845·3	4·0
" 19	February 4, 1914	7,946·5	3·4
" 20	March 17, 1914	10,886·2	3·4
	Average	9,939·0	3·7

Average number of days in lactation period... 451
Average pounds milk per day.................. 22·0

Records of Pure-Bred Holsteins at the Dominion Experimental Station, Lacombe.

Name of Cow.	Freshened.	Pounds Milk.	Butter-fat.
		Lb.	p.c.
Nine Gem Lutske	April 15, 1914	12,038·8	3·1
Lawncrest Lee Beets	May 5, 1914	13,768·1	3·1
Lenore Del Berke Star	March 23, 1914	10,556·2	3·4
Lawncrest Rosa Echo	June 6, 1914	9,308·6	3·1
Maud Sarcastic	March 2, 1914	7,233·8	3·0
Princess Margaret Helbon	May 14, 1914	7,083·2	3·7
Vrouka B. 3rd	August 13, 1914	6,554·0	3·8
Rhoda DeKol Beets	" 3, 1913	8,741·4	3·3
Daisy Johanna Ormsby	September 26, 1913	9,264·2	3·5
	Average	9,505·3	3·3

Average number of days lactation period...... 303
Average pounds milk per day.................. 31·.

Lacombe.

DAIRY COW RECORDS.

Herewith is submitted a record of all the cows which have completed one or more lactation periods during the twelve months ending March 31, 1915:—

RECORD of Dairy Herd Experimental Station, Lacombe, Alta.

Name of Cow.	Date of Dropping Calf.	Amount of chop eaten, at 1 cent per pound.	Amount of hay eaten, at $10 per ton.	Amount of green feed eaten, at $10 per ton.	Amount of straw eaten, at 20 cents per 100 pounds.	Amount of roots eaten, at $3 per ton.	Amount of silage eaten, at $3 per ton.	Months on pasture.	Total cost of feed between calving.	Total milk.	Test.	Number of days in lactation period.	Value of milk at $2 per cwt.	Cost to produce 100 pounds milk.	Profit on 100 pounds milk.	Profit on cow between calving, (calf and labour neglected.)
	1913.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Mos.	$ cts.	Lb.	p.c.	Days.	$ cts.	$ cts.	$ cts.	$ cts.
Lawncrest Rosa Echo	January 13	3,237	2,325	3,720		9,436	....	5½	82 25	12,941·2	3·1	499	258 83	0 64	1 36	176 58
Princess Margaret Hellon	February 9	2,483	2,025	3,510	....	8,374	....	5½	70 57	9,923·8	3·2	473	198 47	0 71	1 29	127 90
Brampton Wolseley Girl	April 5	2,415	3,150	1,650	....	7,200	....	8½	67 45	8,595·7	5 95	500	171 91	0 78	1 22	104 46
Grade 30	April 29	1,815	2,860	2,210	....	7,800	....	5½	60 70	7,607·3	3·85	388	152 14	0 80	1 20	91 44
Grade No. 29	April 26	1,375	2,510	1,950	....	6,340	....	5½	51 06	5,313·2	3·17	369	106 26	0 96	1 04	55 20
Vrouka B. 3rd.	July 28	2,270	3,840	1,820	....	7,470	....	5½	67 70	6,191·4	3·78	324	123 83	1 09	0 91	56 13
Rheda DeKol Beets	August 3	3,025	4,270	1,650	....	9,650	....	4½	78 82	8,741·4	3·47	352	174 83	0 90	1 10	96 01
Daisy Johanna Ormsby	Sept. 26	3,248	4,165	1,830	....	9,550	....	5½	82·27	9,324·3	3·66	367	186 48	0 88	1 12	104 21
Grade No. 32	Sept. 12	1,582	2,520	1,800	....	5,430	....	2½	48 07	5,968·5	3·76	265	119 37	0 81	1 19	71 30
Grade Holstein 18	Dec. 23	1,532	1,910	1,260	....	6,600	....	4½	45 57	5,905·3	3·76	292	118 10	0 77	1 23	72·53
Grade No. 33	Dec. 24	1,156	2,700	1,185	....	5,980	....	5½	45 45	4,401·3	3·31	317	88 02	1 03	0 97	42 57
	1914.															
Brampton Wolseley Thelma	January 22	1,675	2,570	1,060	320	6,370	1,342	5	52 10	6,269·0	5·0	372	125 38	0 83	1 17	73 28
Grade No. 1	February 8	1,593	1,650	1,185	....	6,150	....	4½	43 82	6,113·4	3·85	236	122 26	0 72	1 28	78 44
Maud Sarcastic	March 2	2,618	2,045	820	....	3,050	....	4½	49 58	7,233·8	3·37	234	144 67	0 69	1 21	95 09
Grade No. 5	March 13	1,193	1,125	850	128	3,600	780	5½	34 63	4,895·3	3·93	282	97 91	0 70	1 30	63 28
Nina Gem Lutske	April 15	3,355	2,460	1,789	410	1,520	1,956	5	65 72	12,038·8	3·26	305	240 78	0 54	1 46	175 06
Grade No. 4	May 20	810	275	3,600	....	270	....	5	29 87	3,111·3	3·61	171	62 23	0 96	1 04	32 36
Tehlma's Gem	May 20	1,143	1,260	950	320	1,830	560	5	31·71	3,685·4	5·1	272	73 71	0 85	1 15	42 00
Lawncrest Rosa	June 6	2,477	1,010	840	728	900	1,760	5	44 46	9,508·6	3·36	249	190 17	0 46	1 54	145 71

LACOMBE.

FEEDING TRIALS WITH DAIRY CATTLE.

With the object of obtaining data as to the comparative value of different fodders, feeding trials were begun in November, and continued throughout the entire winter.

All of the dairy cattle not entered in the Record of Performance test were included in these trials. A grain ration, uniform in quality and quantity, was fed throughout the entire duration of this test, and therefore the only variation consisted in the change of rough fodders from period to period. In each case a two weeks feeding test was conducted, and the first week was considered as a preliminary period, the results not used. Two or three facts have been emphasized by these trials:—

(1.) The advantage of succulent fodders for dairy cattle throughout the winter is shown.

(2.) The advantage of peas and oats for ensilage has been demonstrated.

(3.) The high cost of producing milk when certain of our cultivated grasses, such as timothy, are used as the bulky fodder, is brought out by these trials very clearly.

Judged from the standpoint of the cost to produce 1 pound of butter, the various fodders tested rate as follows: Peas and oats silage, peas and oats green feed, corn silage, turnips and straw, wild hay and timothy hay. Peas and oats kept well as ensilage and, since the yield when weighed green will run from 10 to 12 tons per acre, the importance of this crop can not easily be overestimated. This crop vies with corn.

RESULTS OF FEEDING TRIALS.

		Peas and Oats Silage.	Peas and Oats Green Feed.	Peas and Oats Silage.	Peas and Oats Green Feed.	Timothy Hay.	Peas and Oats Green Feed.	Turnips and Straw.	Peas and Oats Green Feed.	Prairie Hay.	Corn Silage.
Number of cows in experiment		19	20	20	20	20	19	18	18	17	17
Average weight at commencement of experiment	lb.	1,158·0	1,150·0	1,270·0	1,114·0	1,159·0	1,150·0	1,109·7	1,100·5	1,156·0	1,114·0
Average weight at finish of experiment	"	1,146·0	1,270·0	1,114·0	1,159·0	1,150·0	1,123·0	1,100·5	1,150·	1,114·0	1,145·0
Average gain or loss in weight	"	−12·0	120·0	−156·0	45·0	−9·0	−27·0	−9·2	49·5	−42·0	31·0
Number of pounds milk produced	"	1,891·3	2,287·9	2,199·5	2,167·4	2,285·9	2,130·2	2,000·4	2,017·7	1,829·5	1,803·9
Average milk per cow per day	"	14·2	16·3	15·7	15·4	16·3	16·0	15·9	16·0	15·37	15·15
Average per cent fat in milk	"	4·23	4·34	4·05	3·93	3·6	4·0	3·68	4·06	3·65	3·53
Total pounds fat produced	"	80·0	99·29	89·07	85·17	82·29	85·20	73·61	81·91	66·78	63·68
Average fat per cow per day	"	0·60	0·70	0·63	0·60	0·59	0·64	0·584	0·65	0·56	0·535
Total meal consumed	"	647·5	714·0	714·0	714·0	756·0	703·0	654·4	654·5	665·5	605·5
Total silage consumed (peas and oats)	"	5,236·0		6,300·0							
Total green feed consumed	"		3,608·0		2,596·0		2,576·0		2,635·0		
Total straw consumed	"	2,220·0		2,000·0				2,436·0			2,040·0
Total turnips consumed	"							8,100·0			
Total prairie hay consumed	"									3,038·0	
Total timothy hay consumed	"					4,655·0					
Total silage (corn) consumed	"										6,330·0
Meal mixture consumed per 100 pounds milk produced	"	34·2	31·2	32·4	32·9	33·0	33·0	32·71	32·43	33·1	33·5
Meal mixture consumed per 100 pounds fat produced	"	809·0	1,020·0	801·0	838·0	919·0	825·0	888·9	799·0	906·0	950·8
Cost of meal at 1c. per lb.	$	6·475	7·14	7·14	7·14	7·56	7·03	6·544	6·545	6·05	6·05
Cost of silage at $3 per ton	$	7·85		9·45							9·50
Cost of green feed at $10 per ton	$		18·04		12·98		12·88		13·175		
Cost of straw at $2 per ton	$	2·22		2·00				2·436			2·04
Cost of hay at $10 per ton	$					23·275				15·19	
Cost of roots at $3 per ton	$							12·150			
Total cost of feed	$	16·54	25·18	18·59	20·12	30·835	19·91	21·130	19·72	21·24	17·59
Cost to produce 100 pounds milk	$	0·87	1·10	0·84	0·92	1·34	0·93	1·056	0·977	1·16	1·97
Cost to produce 100 pounds fat	$	20·67	25·03	20·87	23·62	37·50	23·36	28·70	24·07	31·80	27·62
Cost to produce 1 pound fat	$	0·20	0·25	0·20	0·23	0·375	0·23	0·287	0·24	0·31	0·276
Cost to produce 1 pound butter	cts.	16·7	20·84	16·7	19·2	31·25	19·2	23·9	20·0	26·4	23·0

LACOMBE.

DAIRY PRODUCTS.

The manufacture of cream cheese, butter, and Coulommier cheese was continued during the year. While no special demand has been created locally for the cream cheese, a small quantity has been sold in Calgary. One of the largest city dairies in Calgary, and another in Edmonton, have started the manufacture of cream cheese, and are offering this product through the medium of their delivery wagons to their customers daily. The fact that the work in connection with the manufacture of cream cheese was begun by this Station, was some inducement, at least, to both these dairies to commence the manufacture of a similar product, and thus develop a further outlet for the milk and cream for the dairy farmers of Central Alberta.

It is proposed to start the manufacture of small Cheddar cheese during the coming summer.

A part of the products of the dairy herd is sold as cream, bringing at present 36 cents per pound butter-fat, f.o.b., Lacombe.

LACOMBE.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

DAIRY CATTLE.

Breeding work has been continued during the past year with the same objects as heretofore. A number of the older grade cows have been sold to the butcher, having failed to come up to the standard of production set for the herd, viz., 7,000 pounds of milk and 200 pounds of butter-fat for a mature cow. There have been no losses from death during the entire year.

In the report for last year we mentioned that trouble had arisen from sore teats: this infection was believed to be carried upon a cake of soap, and on the proper use of liquid soap the trouble practically disappeared. This year the infection again appeared among the cows milked exclusively by one man, who, when not watched, neglected to wash his hands thoroughly. When this man left the Farm the trouble ceased to spread. We report this fact to emphasize the importance of a liberal use of soap and water by the milkers, and as a warning to others, because we know that a similar trouble exists in some herds in this country. In this connection also we should like to say something about the judicious use of that necessary instrument, the milk tube. Our experience has proved that, while there are occasions when its use is absolutely necessary, yet in the hands of a careless person it is very dangerous, being apt to cause both mechanical injury and bacterial infection.

Of the nineteen cows which have freshened and finished their lactation period since our last report, 68·4 per cent gave heifer calves, an increase of 18·4 per cent over last year's results. At the time of writing there are in all, sixty-one head of cattle, made up as follows: one bull under 4 years, one yearling bull, three mature cows, four heifers under 2 years, one heifer under 1 year, all pure-breds; in grades, twelve mature cows, nine heifers under 3 years, nineteen under 2 years, and eleven under 1 year.

The herd bull, although not a show animal, is of good size, weighing at 3 years and 10 months, 2,415 pounds (see illustration). He is getting strong, vigorous heifers, quite uniform in type. Two of his heifers have freshened and are producing very well at the present time. Their performance at 2 years is better than that of their dams at maturity, in the same stage of lactation.

The yearling bull that is being used on the heifers of the herd bull, is also of good size. At 15 months of age he weighs 1,240 pounds (see illustration). He is of the same blood lines as the herd bull on the sire's side. His maternal ancestors have been bred in British Columbia for many years, and are known producers. He was purchased as a 4-weeks-old calf from the herd of F. J. Bishop, Duncan, B.C.

As far as size and form is concerned the bull is leaving his mark on the herd. This is clearly shown in plates A, B, and C. Plate A shows cow No. 22 and her four heifer calves dropped on the Farm since 1912. The cow is a very ordinary, small, black-and-white spotted grade. The second heifer from the left is by an unknown sire; she is spotted like her dam, but tall and lanky. The third from the left is her daughter; the fourth is a daughter of the old cow, by the herd bull; as will be seen, she inherits colour from the dam, but size and form from the sire. The fifth, another daughter by the same bull, inherits both size and form, and, to a certain extent, the colour markings of the sire; and the sixth, though only a calf, shows clearly the colour markings of the dam, but the conformation promises to be like its sisters from the same sire.

In contrast to cow No. 22, an illustration is given of cow No. 16 (plate B), which is a cow of much better conformation and colour. Here the influence of sire is not so marked. The daughter of unknown sire, second from the left, is a much superior animal to that of No. 22. The grand-daughter, third from left, is also a finer heifer in every way than the grand-daughter of No. 22. Nos. 4 and 5 in this picture are comparable as regards age with Nos. 5 and 6 in plate A, and are of more desirable type, but do not show so great an improvement over the dam.

Plate C shows cow No. 14 and her progeny. This cow, although black and white, is a genuine "scrub" of fixed type. The daughter of unknown sire (second from left) is apparently no improvement on the dam. Her daughter, however, from a known sire, shows some improvement in colour and type. Nos. 4 and 5 from the left are daughters of the old cow by the herd bull, and although much larger and of somewhat better type than their dam, still show their "scrub" blood, both in form and colour.

These comparisons have reference only to size, colour, and conformation. As we have only three years' work to report upon, it is not possible to bring the performances into the reckoning. When these are available we shall have more evidence concerning the influence of the sire in improving production.

With regard to the nineteen cows which have finished their lactation period since the last report, we give a table showing the details of their performances. The list includes two pure-bred cows, Nos. 61 and 87, and two senior yearling grade heifers of unknown breeding, Nos. 29 and 36. The cost of food, as shown in the table, includes the food consumed while the cows were dry.

DAIRY RECORDS.

Cow No.	No. of days milked.	Total milk produced.	Average per cent. fat in milk.	Total amount fat produced in period.	Total amount meal consumed.	Total amount roots and silage consumed.	Total amount of hay consumed.	Months on pasture at $2.	Total cost of food for period.	Profit on product for period.	Cost to produce 100 lb. milk.	Cost to produce 1 lb. of butter.
		lb.	p.c.	lb.	lb.	lb.	lb.	Mos.	$ cts.	$ cts.	cts.	cts.
87	376	15,901·2	3·4	540·92	3,612	17,710	1,317	4	97 89	208 37	57·97	13·59
3	663	13,470·7	3·6	508·64	2,951	24,044	1,410	4	102 89	181 64	76·47	16·8
61	303	11,519·2	3·1	367·44	3,072	19,285	2,157	4	87 05	122 52	75·57	19·74
9	340	8,888·0	3·4	296·73	1,664	13,470	1,461	4	58 22	109 65	67·01	16·35
19	333	9,884·7	3·16	311·94	2,145	19,205	2,548	4	76 25	101 93	77·13	20·37
25	397	10,740·4	2·9	311·63	2,419	17,725	3,242	4	80 05	99 92	74·53	21·4
17	274	8,627·5	3·13	270·42	1,409	12,673	2,422	4	55 62	99 01	64·46	17·14
4	299	7,842·0	3·4	270·87	1,106	9,927	2,283	4	56 62	96 45	72·2	22·59
14	337	6,889·9	4·0	275·91	1,253	10,930	2,425	4	57 48	95 97	83·43	17·57
16	305	7,803·9	3·53	275·57	1,755	15,859	2,242	4	63 99	91 44	81·09	19·35
11	339	7,183·0	3·3	242·96	1,655	14,823	1,763	4	55 80	81 91	76·29	19·14
22	341	7,255·0	3·2	232·29	1,487	14,097	2,662	4	60 35	72 05	83·18	21·65
6	247	5,857·9	3·11	184·24	1,064	10,770	1,137	4	44 97	60 43	76·83	20·34
8	226	5,593·3	3·39	186·93	831	13,669	1,738	4	48 89	56 90	88·87	21·79
24	241	5,710·5	3·4	193·52	1,958	13,440	1,417	4	53 95	55 65	142·0	38·22
2	273	5,392·6	2·9	160·29	1,229	14,600	1,317	4	53 73	39 09	98·52	27·46
29	350	4,267·8	3·5	152·21	1,459	10,814	1,412	4	50 90	38 67	119·9	22·38
36	320	3,746·6	3·9	146·93	1,101	11,200	1,317	4	44 20	37 69	118·0	25·06
20	244	4,721·1	2·83	133·67	969	11,349	2,531	4	50 39	27 24	65·85	18·23

AGASSIZ.

From this list, for the sake of comparison, we have taken the records of the five most profitable and the five least profitable cows; also the performances of the five most profitable and least profitable of this year, as compared to the average of the last two years.

MOST PROFITABLE COW *versus* LEAST PROFITBLE COW.

1914–15.	Number of days milked.	Yield of milk.	Yield of fat.	Cost of food.	Profit over food.
		Lb.	Lb.	$ cts.	$ cts.
Five most profitable cows:—	376	1,5901·2	540·92	97 89	208 37
	663	1,3470·7	508·64	102 89	181 64
	303	11,519·2	367·44	87 05	122 52
	340	8,888·0	296·73	58 22	109 65
	333	9,884·7	311·94	76 25	101 93
Average	403	11,932·76	405·13	84 46	144 82
Five least profitable cows.	241	5,710·5	193·52	53 95	55 65
	273	5,392·6	160·29	53 73	39 09
	350	4,267·8	152·21	50 90	38 67
	320	3,746·6	146·93	44 20	37 69
	244	4,721·1	133·67	50 39	27 24
Average	285·6	4,767·72	157·32	50 63	39 67

Cow number.	Number of days milked.	Yield of milk.	Yield of fat.	Cost of food.	Profit over food.
		Lb.	Lb.	$ cts.	$ cts.
87	376	15,901·2	540·92	97 89	208 37
20	244	4,721·1	133·67	50 63	27 24

STATEMENT for three years.

Average of five cows.	Five most profitable cows.		Five least profitable cows.	
	1912–14. Average.	1914–15.	1912–14. Average.	1914–15.
Number of days in lactation period	331·5	403	285	285·6
Total yield of milk, Lb.	9,864·1	11,932·76	6,686·3	4,767·72
Total yield of butter-fat "	350·8	405·13	219·75	157·32
Total cost of food $	57·23	84·46	44·58	50·63
Total profit over cost of food $	129·5	144·82	73·18	39·67

AGASSIZ.

COST OF RAISING DAIRY HEIFERS.

We give again figures on the cost of raising dairy heifers throughout the year. The calves were started on whole milk, which by degrees was replaced by skim-milk. They were taught to eat a cheap mixture of grains as early as possible, and were given hay, roots, and silage as soon as they would eat them. Following are given the amounts of food consumed per month, and cost; also the gain in live weight per month.

Cost of Raising Dairy Heifers.

Month.	Weight.	Food Consumed.					Cost.
		Whole milk.	Skim-milk.	Grain.	Hay.	Silage Roots.	
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	$ cts.
1st	81	217	372	31	10	....	5 51
2nd	140	150	360	30	10	300	4 87
3rd	200	49	372	77	70	310	3 26
4th	245	150	360	46	82	51	4 76
5th	260	....	....	31	84	226	1 16
6th	310	....	....	93	170	450	2 78
7th	365	....	....	81	156	464	2 67
8th	415	....	....	80	160	537	3 15
9th	440	....	....	50	170	450	2 23
10th	520	....	....	62	254	676	3 20
11th	555	....	....	70	216	624	3 10
12th	625	....	....	77·5	132	932	3 09
Total	....	566	1,404	728·5	1,514	5,020	39 78

This is the average of a group of grade heifers which were kept on skim-milk for four months only. On account of the experimental work in the herd, there was some irregularity in the kinds of grain and roughage supplied each month; in fact, the ration was changed in at least one constituent every two weeks from October to March. In spite of this they averaged 1·5 pound daily gain from birth, at a cost of 7·3 cents per pound, which is exactly 1 cent higher than those raised last year. The daily gain, however, is the same as last year's heifers, which were not hampered by experimental work.

EXPERIMENTAL FEEDING.

Conditions were not altogether favourable for experimental work, since many of the cows were far advanced in their lactation periods. However, three trials were made with the entire milking herd: these consisted of tests of soy bean meal and cocoa bean husks as foods for milk and butter production. Another test was made of clover silage versus corn silage for the production of milk and butter.

Trial 1.—Soy bean meal compared with oil cake for milk and butter production.

This trial lasted over a period of twelve weeks. The foods were fed in combination with wheat bran and brewers' grains in equal parts in these experiments. The rations were always mixed in the following proportions: five parts by weight of wheat bran; five parts by weight of brewers' grains; two parts by weight of oil cake, soy bean, or cocoa bean husks.

The roughage fed consisted of: Corn silage, 2 parts; mangels, 2 parts; clover hay (chaffed), 1½ part, by weight. This mixture cost $5.25 per ton; the cattle were given all that they could consume twice daily.

The cattle were run through six periods of two weeks each; in periods 1, 3, 5, and 7, they received linseed oil cake, and during periods 2 and 6 soy bean cake was fed. In the following protocols the details of each period are given in tabulated form.

TRIAL 1.—Oil Cake *versus* Soy Bean Meal.

	Oil Cake Meal. Periods 1, 3, 5,7 Average.	Soy Bean Meal. Periods 2 and 6. Average.
Number of cows in test	15	15
Average milk per cow per day, Lb.	21·21	20·49
Average per cent fat in milk	3·17	3·09
Average pounds fat per cow per day Lb.	0·6577	0·6345
Mixture consumed for 1 pound fat produced "	10·95	11·68
Mixture consumed per 100 pounds milk produced "	34·74	36·16
Roughage consumed per 100 pounds milk produced "	1,253·53	2,554·58
Roughage consumed per pound fat produced "	79·83	82·56
Nutritive ratio of total ration	1:4·84	1:4·87
Total cost of food $	23.35	23·61
Cost to produce 1 pound fat "	0·35	0·36
Cost to produce 1 pound butter "	0·29	0·30
Profit on 1 pound butter at 40 cents "	0·11	0·10
Cost to produce 100 pounds milk "	1·10	1·13
Profit on 100 pounds milk at $1.80 "	0·70	0·67

From these figures it will be seen that linseed oil cake gave slightly better results. When both foods are purchased at the same price, it would appear better, from the point of view of production, to feed linseed oil cake than soy bean cake.

Trial 2.—The value of cocoa bean husks compared with linseed oil cake for milk and butter production.

The cocoa bean husks is a by-product from chocolate factories. It looks very much like the brown husk from peanuts, but it has a pleasant chocolate odour. The material used was analysed by Dr. Frank T. Shutt, Dominion Chemist, Ottawa, who reports the following:—

	Per Cent.
Moisture	6·44
Crude protein	15·89
" fat	11·
Carbohydrates	43·35
Crude fibre	15·10
Ash	8·22
	100

Fertilizer constituents:—	Per Cent.
Nitrogen	2·54
Phosphoric acid	1·01
Potash	2·80

It will be noted that the husks contain liberal quantities of crude protein and fat. There is also a high crude fibre content, as compared with ordinary concentrates in common use.

AGASSIZ.

The husks were ground finer than ordinary bran, and mixed with brewers' grains and wheat bran in the proportion of 2 : 5 : 5 by weight. They were used to replace an equal weight of linseed oil cake. At first the cows did not like it very well, but in a few days they became accustomed to the odour and ate the food readily. Only six weeks could be given to this trial, but from the work done we conclude that the husks are not as valuable for food as linseed oil cake, even when they can be purchased for $20 per ton as compared with $35 per ton for oil cake.

The following figures will illustrate the results obtained:—

TRIAL 2.—Oil Cake *versus* Cocoa bean husks.

—		Oil Cake Meal. Periods 3 and 5. Average.	Cocoa Bean Husks. Period 4.
Number of cows in test		17	17
Average milk per cow per day	Lb.	20·26	18·09
Average per cent fat in milk		3·18	3·44
Average pounds fat per day per cow	Lb.	0·645	0·62
Mixture consumed per pound fat produced	"	11·25	11·64
Mixture consumed per 100 pounds milk produced	"	35·84	39·99
Roughage consumed per pound fat produced	"	80·945	86·64
Roughage consumed per 100 pounds milk produced	"	267·64	297·53
Nutritive ratio of total ration		1:4·83	
Total cost of food	$	27·38	26·72
Cost to produce 1 pound fat	"	0·35	0·36
Cost to produce 1 pound butter	"	0·297	0·301
Profit on 1 pound butter at 40 cents	"	1·03	0·009
Cost to produce 100 pounds milk	"	1·14	1·24
Profit on 100 pounds milk at 18 cents	"	0·66	0·56

It will be seen that the flow of milk decreased over 2 pounds per day per cow when the husks were fed; also that the yield of fat per cow per day was slightly less. Although the total cost of the food was less when the husks were fed, the cost to produce 100 pounds of milk or fat was increased. If the husks could be purchased for $10 per ton, and carriage charges were not too great, one could afford to feed a limited quantity.

Trial 3.—Clover silage compared with corn silage for milk and butter production.

We have made several attempts at this Farm to put up a clover silage which would be a satisfactory dairy food, and this year the attempt has been fairly successful. It was put up at first without being chopped, and the results were not good. The silage did not cure well and at feeding time was hard to handle, and the odour was objectionable. It was unfit to use in a dairy stable. Another season it was chopped in 1 inch lengths and well tramped into the silo. In this form it proved superior to the unchopped silage, because the odour was not so strong and the flavour was better.

Last season, over 124 tons were put in. It was cut in ½-inch lengths. While the silo was being filled, some water was added at intervals and the clover very firmly tramped down. The result of this procedure was good. The clover cured well. The odour was not stronger than ordinary silage, and the flavour was apparently good, because the silage was readily eaten by the stock. The quality of the raw material was the poorest which we have used. There was a small amount of rye grass and some bracken mixed in. The clover has always been harvested when in bloom.

AGASSIZ.

In this trial the clover silage just described was tested against corn silage of good quality, grown the same season as the clover. The corn was harvested in the soft dough stage, and was cut in ½-inch lengths.

The trial lasted six weeks. The roughage consisted largely of silage, being mixed with mangels and cut clover hay in the following proportions: Silage, three parts, by weight; cut hay, one part, by weight; mangels, one part, by weight.

The cows were given all they would consume of this mixture.

The grain fed along with this roughage consisted of: Wheat bran, ninety-six parts; linseed oil cake, thirty-six parts; cocoa bean husks, one part. The following figures show the results which we obtained:—

Trial 3.—Clover silage *versus* Corn silage.

—		Corn Silage.	Clover Silage
		Periods 8 and 10, average.	Period 9.
Number of cows in test		16	16
Average milk per cow per day	lb.	19·61	18·53
Average per cent fat in milk		3·33	3·4
Average pounds fat per cow per day	lb.	·671	·629
Meal mixture consumed per pound fat produced	"	10·68	10·62
Meal mixture consumed per 100 pounds milk produced	"	35·7	36·8
Roughage consumed per 100 pounds milk produced	"	276·6	283·2
Roughage consumed per pound fat produced	"	82·8	83·4
Total cost of food	$	25·26	23·70
Cost to produce 1 pound fat	$	·335	·336
Cost to produce 1 pound butter, at 40 cents	$	·268	·269
Profit on 1 pound butter, at 40 cents	$	·132	·131
Cost to produce 100 pounds milk	$	1·12	1·14
Profit on 100 pounds milk, at $1.80	$	·68	·66

From these figures it will be seen that with the conditions in which we were working, this season at least, there is not a great deal of difference between the two forms of silage for milk and butter production. The advantage, where any is shown, is in favour of corn silage. This advantage can be accounted for, we think, by the fact that the corn silage is more palatable than the clover silage. Although the clover was eaten by the cows as if they liked it, they showed more eagerness for the corn, and they consumed a larger quantity of it than they did of clover silage.

More work will be done another season with other crops of the same material, to see whether this year's results will be repeated.

SUMMARY.

(1) From the evidence obtained in trials made this season, we would recommend linseed oil cake in preference to soy bean meal, even when combined with nitrogenous foods, such as wheat bran and dried brewers' grains.

(2) If cocoa bean husks could be purchased cheaply, they could be used to a limited extent to replace higher priced grains in a succulent ration.

(3) If clover is cut when in bloom and properly made into silage, it is a valuable form of winter food for dairy cows.

Agassiz.

CALF-REARING TRIALS.

Owing to the difficulty of not having a sufficient number of heifer calves to work with, each group was small. It must be kept in mind, therefore, that differences in results with so few animals might be due to the individuality of the calves used, and not entirely to the different foods. The calves used were all grade Holsteins.

The object of the experiment was to compare two ordinary substitutes for skim-milk, Blatchford's calf meal and linseed oil cake. The calf meal was fed according to the directions given by the manufacturers. All the calves were fed on whole milk for the first fourteen days, this being charged to them at the rate of $1.80 per hundred pounds. As soon as they would feed, they were given a roughage mixture consisting of: Clover hay, fifteen parts, by weight; mangels, twenty parts, by weight; corn silage, twenty parts, by weight. This mixture cost 26 cents per cwt.

The grain mixture, of which they were given as much as they would eat, was as follows: Ground oats, two parts; wheat bran, two parts; ground corn, two parts; linseed oil cake, one part. This mixture cost $1.62 per cwt.

Skim-milk was charged at 25 cents per cwt., linseed oil cake at $1.75 per cwt., and Blatchford's calf meal at $4 per cwt.

The results of this limited trial are given in the following table:—

Calf Feeding Trials.

		Lot I.	Lot II.	Lot III.
		Linseed oil Cake.	Blatchford's Calf Meal.	Skim-milk.
Number of heifers in test		2	2	3
Total weight at birth	lb.	176	175	266
Average weight at birth	"	88	87·5	88·5
Total weight at 14 days	"	210	222	363
Average weight at 14 days	"	105	111	121
Total weight at end of period	"	372	364	621
Average weight at end of period	"	186	182	207
Total gain during feeding period	"	196	189	355
Average daily gain per calf during feeding period	"	1·325	1·038	1·39
Average duration of feeding period	"	74	91	85
Amount of roughage fed	"	441	886	978
Amount of grain fed	"	114	226	248
Amount of whole milk fed	"	552	213	814
Amount of skim-milk fed	"	781	195	1,642
Amount of test food fed	"	102	291	....
Cost of roughage fed	$	1·15	2·30	2·54
Cost of grain fed	$	1·85	3·66	4·02
Cost of whole milk fed	$	9·40	3·83	14·65
Cost of skim-milk fed	$	1·95	·49	4·10
Cost of test food fed	$	1·78	11·64	....
Total cost of food fed during period	$	16·13	21·92	25·31
Amount of roughage fed for 100 pounds gain	lb.	225	268·7	275·49
Amount of grain fed for 100 pounds gain	"	58·16	119·57	69·86
Amount of whole milk fed for 100 pounds gain	"	266·32	112·7	299·3
Amount of skim-milk for 100 pounds gain	"	398·47	108·47	463
Amount of test food fed for 100 pounds gain	"	52·04	153·96	....
Cost to produce 100 pounds gain	$	8·23	11·60	7·13

We have few comments to make with so limited a trial, but the work will be repeated this winter with a larger number of calves. Although lot 3, fed skim-milk, contained three calves to two each in the other lots, one of these was a weakling, and it was therefore thought inadvisable to use this animal with the milk substitutes. All the calves appeared to be in healthy growing condition. Those receiving skim-milk made the most profitable gains, those getting linseed oil cake came next, and those fed Blatchford's calf meal, third.

Agassiz.

DAIRY WORK FOR YEAR 1914.

The dairy work has been considerably interrupted on account of the repairs and alterations which have been made with a view to increasing the facilities for cheese-making, and enlarging the storage capacity of the dairy.

We have now a good cheese-making room, drying-room, and three small curing-rooms, partly underground, which gives us cellar temperatures. This gives us a building which is properly insulated, and is suitable for the making of Cheddar, Stilton, and soft, as well as ripened, cheeses.

With the conditions prevailing in our old dairy we have found the following methods best for making Camembert, Stiltonette, small Cheshire, and Coulommier cheeses. In all, difficulty was experienced in preventing too great evaporation during ripening. This was owing to the fact that the season was exceptionally dry, and the curing-room too warm.

CAMEMBERT.

The lack of moisture here was supplied by wrapping the cheeses in moistened parchment paper; they were then inclosed in boxes, where they matured. The finished product retains 45 to 50 per cent moisture.

June 11.—15 pounds milk, 2·5 c.c. starter (made from centre of a well-ripened cheese). Temperature: milk 82°; making room 68°. Milk inoculated 10.15 a.m. Milk renneted 2.15 p.m. Curd moulded 6 p.m. Three cheeses obtained from this weight of milk.

June 12.—Cheese turned, salted, and demoulded.

June 15.—Taken to curing room.

June 26.—Boxed.

July 11.—Ready for market. Good flavour and texture. This method was found to give a product true to type and fairly uniform.

STILTONETTE.

A small cheese, resembling the imported Stilton and weighing when ripe from $1\frac{1}{2}$ pounds to $1\frac{1}{4}$ pounds according to age. It may be used at 2 months, but a well made cheese improved in flavour up to 4 or even 5 months. The milk should test not less than 3·5 per cent.

May 26.—20 pounds milk (sweet), one-half pint starter having acidity 0·64, 3 c.c. rennet. Temperature: milk, 85°; Room, 66°. Milk inoculated 12 o'clock noon. Milk renneted 12·10. The method followed was practically the same as for the full-sized Stilton, except that pressure up to 4 pounds was used.

July 30.—This cheese was ready for market. Texture: soft, loose, and crumbly. Green veined all through. Weight $1\frac{1}{2}$ pounds. A good reproduction of Stilton.

SMALL CHESHIRE.

A mild-flavoured cheese, weighing about 2 pounds when ripe. It resembles in flavour and texture the English Cheshire, but the process is not the same. The protocol of a good specimen is given below.

July 21.—25 pounds sweet milk (acidity at time of renneting, -0·18), 3 c.c. rennet. Temperature: milk, 88°; room, 68°. Renneted 11.15 a.m. Cut into $\frac{3}{4}$-inch cubes, 12.45 noon. Ladled 1 o'clock p.m. on to two racks with cloths over. Once during the afternoon curd was scraped from the cloth to facilitate drainage. It is important that the whey be drained off quickly. Moulded, 8 p.m. Turned at once. Turned 11 p.m. A 5 pound weight put on.

AGASSIZ.

July 22.—A.M., pressure increased to 14 pounds. Removed at noon. P.M., $1\frac{1}{2}$ ounces salt rubbed in. Hoop replaced.

July 24.—6.15 a.m., put to soak in strong brine; 2 p.m., removed from brine, bandaged.

July 26.—Taken to curing room. Turned daily.

August 18.—Ready for market. Flavour: mild, rich, and mellow. Texture loose and open.

Coulommier was made all through the season until November, together with a small quantity of cream cheese. No cheese work was done between November and February, owing to alterations in the dairy building.

During October and November some experiments were made with *B. bulgaricus* as a starter for butter- or cheesemaking. It was found that sterilized skim-milk inoculated with this organism, and kept at a temperature of 90° to 100°, made a useful starter. The organism was obtained from Park, Davis, contained in small tables.

Besides the cheese work, butter was made throughout the year. A considerable amount of official testing for the pure-bred cows has been done, and composite samples from each individual animal have been tested five times per month. The number of farmers who are availing themselves of the opportunity of having their milk tested at this dairy has greatly increased this year, and we are now testing samples from a considerable number of herds each month. Though this entails some extra work, the expense is justified by the increased interest shown by the owners of herds in the district served by the Farm.

AGASSIZ.

HORSES.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN,

E. S. ARCHIBALD, B.A., B.S.A.

The horses on the Central Experimental Farm, as in previous years, have been maintained largely for labour purposes. A start was made in breeding work in the fiscal year ending March, 31, 1913. Five mares proved to be in foal. One of these mares was sent to the Experimental Station at Lennoxville, Que. The other four mares, unfortunately, overran their time from two to four weeks. The foals were all extremely weak, and died within twenty-four hours in spite of the very best care that could possibly be given. The conditions which influenced this most peculiar series of accidents were carefully studied by the Health of Animals Branch, but, to date, no solution has been found. The mares were working regularly, and were in first-class breeding condition at the time of foaling. These mares have again been bred, and it is to be hoped that during the coming fiscal year better results may be obtained.

There are now on the Central Experimental Farm, twenty-six head of horses, made up as follows: Thirteen heavy draught grade Clydesdale geldings, four pure-bred Clydesdale mares, four grade Clydesdale mares, two expressers, two light driving horses, one Clydesdale stallion colt 2 years of age.

I regret to report the loss of two pure-bred Clydesdale mares during the year. Both of these mares were young and, although worked regularly, were in fairly good condition; yet, owing to a predisposition to stomach trouble, they succumbed in spite of the very best care and treatment. This heavy loss has, unfortunately, converted the usual credit balance in the horse statement into a debit balance.

Particular credit in the care and management of the horses is due to the farm foreman, Mr. D. D. Gray, who has the direct care of this class of stock; and also to the stableman, Mr. John Nevins, whose interest and untiring attention is shown in the condition of the horses in spite of the heaviest year's work in the history of the Farm.

HORSE LABOUR.

The twenty-two heavy draught mares and geldings on the Farm are expected to do all the work, not only on the 200-acre farm, but, in addition, to supply the necessary labour to the Horticultural, Cereal, Poultry, Agrostology, Botanical, and other Divisions. In addition, a large amount of hauling and cartage in connection with all the divisions, as well as roadmaking, messenger service, and the like, takes up much of their time. A great deal of horse labour was necessary during the past year in the hauling of materials for the new cattle barns, as well as grading and cleaning up about these buildings. Following is a detailed statement of the horse labour for the past fiscal year.

During the year April 1, 1914, to March 31, 1915, the work done by horses kept in the stables was equivalent to 7,174 days' work, distributed as follows:—

	Days.
Live stock, hauling feed, milk, etc.	277½
Farm work (200-acre farm)	2,089½
Manure on 200-acre farm	461
Horticultural Division and lawns	1,059½
Cereal Division	670½
Poultry Division	59
Agrostology Division	50
Exhibition Division	31½
Bulletins to and from offices	49
Botanical Division	158½
Omnibus service and supervision of work	1,460
Care of roads on farm	50
Various, including hauling freight, sidewalks, buildings, etc.	758
Total	7,174

FEEDING THE WORK HORSES.

The feeding of the work horses was conducted along the same lines as in former years. Readers desirous of discovering the hours of feeding, varieties and quantities of feeds given, rates of feeding for different weights of horses, and the like, are referred to the report for the Fiscal Year ending March 31, 1914.

FINANCIAL STATEMENT FOR HORSES.

Below are submitted the inventories and returns from horses on the Central Experimental Farm during the year April 1, 1914, to March 31, 1915.

——	April 1, 1914.		March 31, 1915.		Returns from Labour.	Gross returns including decreased value and labour and manure.
	No.	Value.	No.	Value.		
		$		$	$	$
Horses	27	9,925 00	26	9,375 00	5,021 80	4,641 80

Returns.

By 7,174 days' labour at 70 cents	$5,021 80	
170 tons manure at $1	170 00	
Gross returns		$5,191 80

Expenditures.

To decreased value of horses	550 00	
Cost of feed and bedding	2,525 00	
Purchases	1,0[illegible]5 00	
Shoeing of horses	35 50	
Labour, stableman	725 00	
Harness and repairs	375 50	
Gross expenditures		5,561 00
Net debit balance against horses		369 20

OTTAWA.

EXPERIMENTAL STATION, CHARLOTTETOWN, P. E. I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

HORSES.

A team of Clydesdale mares was purchased in the spring of 1914 for breeding purposes. They were bred to "Baron Kelvin," and "Darling of Taunton" is now carrying a foal. During 1914 a large percentage of the foal crop in Queen's county was lost. In some sections many mares also died. The trouble apparently was contagious abortion and the complications that frequently accompany that disease. The grade Clydesdale mare at the Station aborted a still-born foal on May 10, one month before her time was up. Nothwithstanding every effort that was made by the veterinarian and the men on the farm, she died of blood poisoning on the 12th of May. A team of draught mares and a team of geldings were kept for labour purposes. One gelding was used for light work and driving.

CLASSIFICATION OF LABOUR.

The labour performed by the horses during the fiscal year was as follows:—

	Hours.
Farm work	7,901
Horticulture	356
Roads	372
Hauling manure	1,673
Draining land and hauling tile	545
Messenger service	1,264

FEEDING.

During the heavy work the draught horses were fed as follows: 13·3 pounds hay, 6·6 pounds oats, and 2 pounds bran per 1,000 pounds live weight; and during light work, about 14 pounds hay, 4 pounds oats, and 3 pounds bran per day. Roots were fed as required.

Three draught mares that were working part of the time were fed natural grass hay and a meal mixture consisting of about equal parts of oats and bran for the three winter months of January, February, and March. The hay was valued at $7 per ton, although it was apparently not as good as good oat straw. The oats and bran were valued at $26 per ton and the roots at $2 per ton.

WINTER Feeding of Horses.

Name.	No. of days.	Amount of work.	Feed Given. Hay.	Oats.	Bran.	Roots.	Cost of Feed.	Weight Jan. 1.	Weight Mar. 31.	Gain or loss.
	Dys.	Hours.	Lb.	Lb.	Lb.	Lb.	$	Lb.	Lb.	Lb.
Mattie	90	59	1,413	472	480	207	17·51	1,455	1,505	50
Kate	90	254	1,413	510	486	207	18·09	1,435	1,470	35
Nell	90	524	1,422	586	495	207	19·22	1,470	1,455	[1]15

[1]Less.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

HORSES.

There are at present eleven horses kept at this Farm, including eight heavy horses which are used for heavy work in all departments, as well as miscellaneous trucking. Two are pure-bred Clydesdale mares purchased in the spring of 1913 with a view to raising colts. Though bred last year they did not prove in foal. However, they will be bred again this coming season.

The three lighter horses are used for express work, cultivating gardens, spraying, mowing lawn, and driving. The brown mare "Princess," who had the misfortune to injure her fetlock, was exchanged for a nice 3-year-old mare for express work, as the old horse "Jim" is now too slow for the road, but can be used to advantage on the cultivator and lawn mower. The third light horse is used for driving purposes.

EXPERIMENTAL STATION, KENTVILLE, N. S.

REPORT OF THE SUPERINTENDENT, W. S. BLAIR.

HORSES.

Seven horses have been kept during the past year. These were fed during the winter on the following grain mixture: 150 pounds bran; 150 pounds cracked corn; 150 pounds crushed oats.

Twelve pounds of this mixture is fed to each draught horse, and 9 pounds to the driving horse. Each horse receives 18 pounds of hay per day, with a few carrots. During February and March one pint of feed molasses was fed to each horse per day.

After the 1st of April the feed is gradually increased and a ration composed of 300 pounds crushed oats and 100 pounds bran is given at the rate during the spring and summer of 18 pounds per day for each draught horse.

The winter ration as outlined above keeps the horses in good condition but, for heavy horses and with much work, it is not sufficient and should be increased in order to keep the teams in good flesh.

OXEN.

Three pair of heavy oxen were worked during the summer. Their feed while working was a mixture of 100 pounds crushed oats and 100 pounds corn meal, fed at the rate of 10 pounds per day in three feeds. Twenty-five pounds of hay was consumed by each per day.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

HORSES.

There were twelve draught horses at the beginning of the year, of which three were pure-bred imported Clydesdale mares, five Clydesdale grade mares, two Percheron grade mares, and two draught bred geldings; and a Standard bred Morgan cross-bred driving mare. A general purpose mare of 1,200 pounds weight was bought in May. A pure-bred Clydesdale mare, a grade Clydesdale mare, and both Percheron grade mares foaled. The foal from the pure-bred Clydesdale mare died when 3 days old, from pneumonia, and one of the grade Percheron foals died at 3 months of age, from the same disease. The grade Clydesdale colt weighed, when 1 year old, 920 pounds, at a food cost of $36.75, and the Percheron grade filly, 875 pounds, at a food cost of $35.

The twelve draught horses and mares weighed from 1,550 to 1,775 pounds each in normal working condition.

The average cost of feeding these horses for the year was $149, and shoeing and stable supplies averaged $15 each, a total of $164.

Their ration was the same as reported last year, with the exception of two mares that were fed from December 20 to March 20, one on hay, straw, and turnips, the other on hay, straw, and carrots.

Their daily ration from May 1 to November 1 was as follows Whole oats, 15 to 16·5 pounds; bran, 2 to 3 pounds; hay, 15 to 20 pounds.

During November the grain ration was slightly reduced, and from 5 to 10 pounds turnips was added.

The horses worked steadily ten hours per day for eight months and five hours per day for four months, and kept in good flesh.

The pure-bred Clydesdale mare "Gertie," 9 years old, and her mate, a grade Clydesdale mare "Queen," 8 years old, both being non-pregnant, were gradually reduced in their grain ration during December until on the 20th they began a three-months term of feeding without grain, getting 15 pounds of hay and 15 pounds of oat straw daily. In addition, "Gertie" took 15 pounds of turnips and "Queen" 15 pounds of carrots daily.

EXPERIMENT IN WINTER FEEDING.

—	Weight Dec. 20.	Weight Mar. 20.	Loss in Weight.
	Lb.	Lb.	Lb.
Gertie	1,575	1,460	115
Queen	1,625	1,535	90

These mares did no work, but were given a yard run daily. They maintained excellent health, and the cost of feeding for the three months was as follows:—

Gertie.

Hay,	1,350 pounds at $10 per ton	$ 6 75
Straw,	1,350 " at $6 per ton	4 05
Turnips,	27 bushels at 8 cents per bushel	2 16
		12 96

Queen.

Hay,	1,350 pounds at $10 per ton	$ 6 75
Straw,	1,350 " at $6 per ton	4 05
Carrots,	27 bushels at 10 cents per bushel	2 70
		$ 13 50

At the close of the experiment they were gradually brought back again to a full grain ration, and were given light work during the transition.

Based on the earning power of each horse being 70 cents per day, the Station horses each earned $140 from April 1 to November 30, and from December 1 to March 31, half time, $32.90; a total earning power of $172.90 at a cost for feed, shoeing, stable supplies, etc., of $164 each. Had it, however, been necessary to hire the Station work done, at prevailing rates for team hire, each horse employed would have cost in wages $1.40 per day and, instead of crediting up a profit of only $8.90 per horse for the year, there was a saving to the Station, by using its own horses, of $172.90 per horse, for which credit might properly be given.

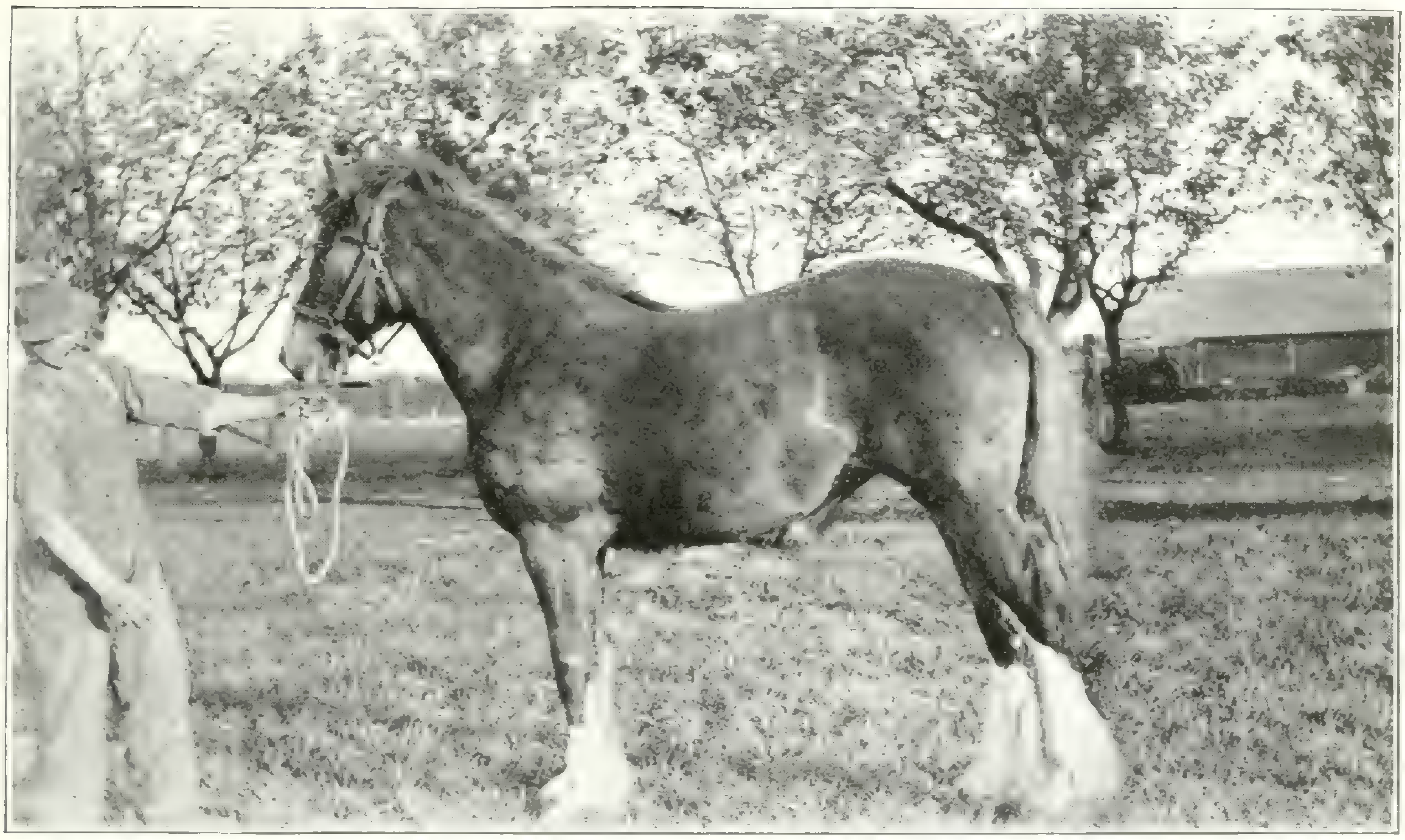
FREDERICTON.

Four Registered Clydesdale mares of Experimental Station, Lennoxville, P.Q., 1915.

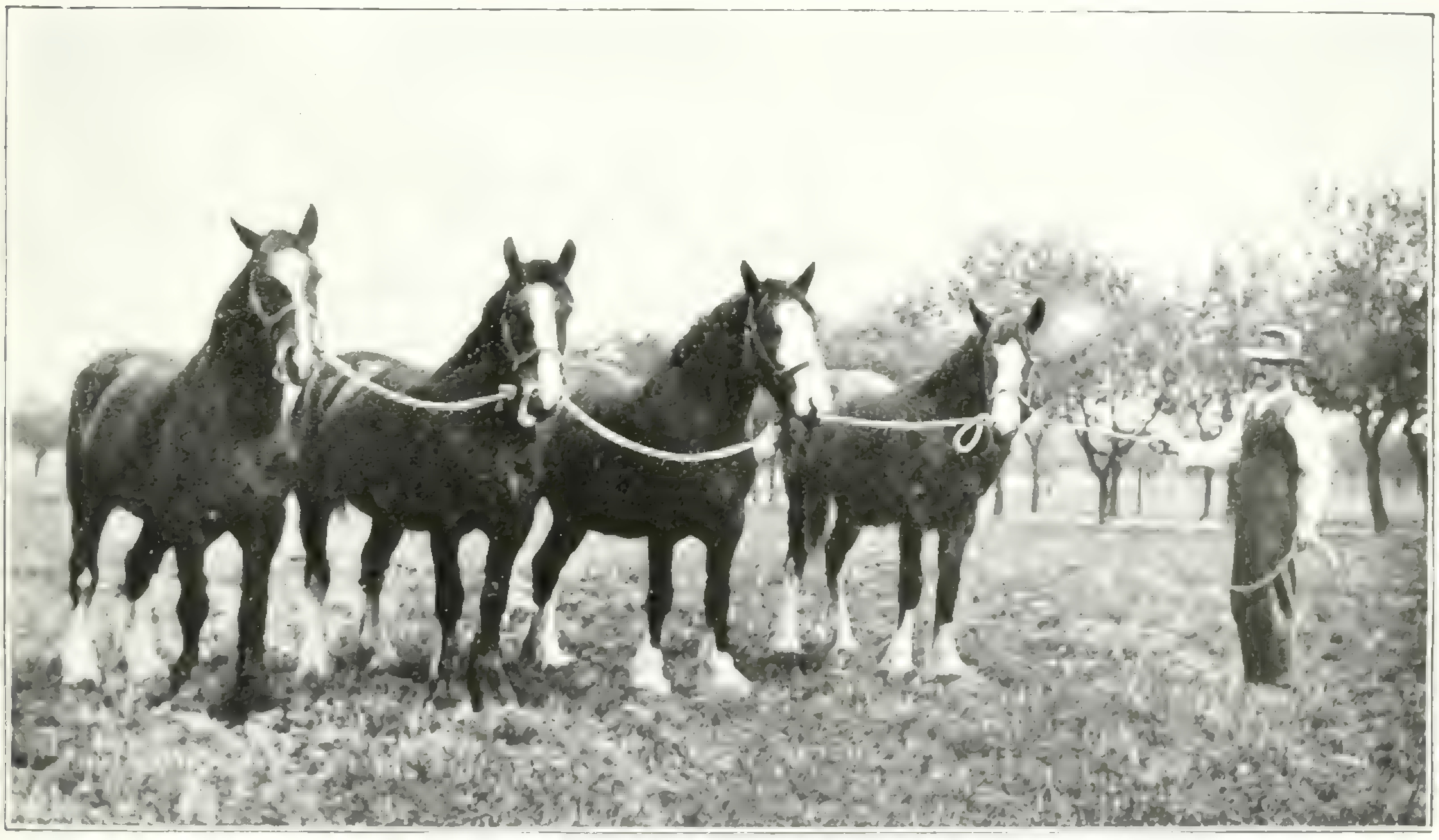
16—1916—30a.

Group of French-Canadian horses Experimental Station, Cap Rouge, Que.

Brandon : Line-up of Farm work-horses.



Experimental Farm, Indian Head, Sask. Clydesdale 12 months Filly "Bonnie Jean Bruce".



Experimental Farm, Indian Head, Sask. Group of Clydesdale mares. From left to right: No. 1, 7 years; No. 2, 4 years; No. 3, 6 years; No. 4, yearling filly.

Two year old Fillies, ran out every day all winter. Experimental Station, Lacombe.

16—1916—39b.

Agassiz, B.C. Clydesdale colts helping prepare the corn land.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

HORSES.

The horses are kept for labour purposes only. Four horses have been purchased during the year to carry on the new work on the increased acreage of the farm. The horses now at this Station number eleven head, comprised of one registered Canadian mare weighing 1,060 pounds and five teams of draught horses weighing, respectively, 2,550, 2,680, 2,800, 2,975, and 3,200 pounds each pair. In addition to the routine work on the farm, these horses are used for breaking new land, clearing away stones, and hauling building materials.

The grain ration given to the horses consisted of a mixture of oats and wheat bran, in the proportion of 1 part of bran to 5 parts of oats. This was fed at the rate of one-half to one pound for every hundred pounds weight of the horses. The wheat bran was decreased and the oats proportionately increased when the horses were put on extra heavy work.

The hay fed was a mixture of clover, timothy, and couch-grass. The working horses, excepting those on experiment, were given all the hay they would clean up. The total amount of hay eaten by four teams of horses on light but steady work during the six winter months would seem to indicate that the proportion of a little less than 1 pound of hay for every hundred pounds of weight of the horses is a fair average.

ECONOMICAL WINTERING OF HORSES.

An experiment bearing on the economical wintering of a pair of draught horses was conducted during the winter, from November 1 to March 31. During the month of November the horses were gradually changed from the regular ration to the experimental ration, and in April they were gradually brought back again to the regular ration. These two months were considered only as periods of transition.

The work done by these horses was exactly the same each day. They were used for delivering milk to the customers, a walk of about 2½ miles per day. The horses were tied and could not get any feed but what was charged to them. The bedding consisted of shavings, so as to make sure of this.

One pound of mixed hay (clover and timothy), 1 pound of good quality oat straw, and 1 pound of swede turnips was given to each horse for every hundred pounds of his weight, to which was added 1 pound of wheat bran per horse per day.

Every morning their mangers were cleaned out, and the feeds left over were carefully weighed once a week. The total amount of feeds thus removed in the 121 days was as follows:—

	Pounds.
No. 1—	
Hay	28
Straw	45
Swedes	380
No. 2—	
Hay	36
Straw	80
Swedes	460

The swede turnips were of good quality, but did not appear to be relished by the horses. They were consumed with aversion, especially at first. Horse No. 1 lost 2 per cent of his weight during the winter, and No. 2 lost 2½ per cent. The health of these two animals was perfect throughout the winter, and their energy and appearance did not fail them.

This experiment will be duplicated during the coming winter and, if possible, with the same horses. The swede turnips will be replaced with beets and carrots, which are decidedly superior for the feeding of horses.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

HORSES.

There are now nineteen horses at the Station: fourteen registered French Canadians—nine mares, two 2-year-old fillies, one yearling stallion, 2 weanlings; also two teams of from 2,600 to 2,900 pounds weight, and a driver. They have all been, and are now, in very good condition. These horses are kept for work, experimental feeding and housing, and to sell high-class breeders at a reasonable figure.

HORSE LABOUR.

Leaving the young things out, also a mare kept idle nearly six months for experimental purposes, there were fourteen horses kept for work, and the following figures show what they were employed at:—

	Hours.
Farm work	11,909
Live stock, hauling feed, bedding, water	2,367
Care of grounds and roads	849
Horticultural Division	755
Bee Division	98
Poultry Division	91
Exhibitions, ten horses shown	1,056
Hauling manure from outside	6,081
Clearing land	20
Draining	32
Maintenance of equipment	168
Waterworks, construction	1,083
General supervision, messenger service, odd jobs	2,824
Buildings, construction and repairs	735
Fences, repairs	38
Fuel, hauling coal and wood	200
	28,306

This was an average of over 200 full days of ten hours per horse, for the year. There were two brood mares and a filly in the lot, so that the horses were fairly well employed all through the year.

Experimental Feeding of Horses.

WINTERING A HORSE AT LOW COST.

This question of wintering horses at a low cost and still have them fit to perform their work in the spring, is quite an important one, as in most cases a farmer cannot utilize all his teams in the winter time. For the fourth year in succession, this experiment has shown that a horse, doing nothing, can be kept in good shape by receiving 1 pound of rough hay, 1 pound of oat straw, and 1 pound of carrots or swedes per hundred pounds of live weight. In 1914-15, a pure-bred French Canadian mare, 11 years old, was used for the experiment, which lasted 151 days, from November 1, 1914 to March 31, 1915. This mare was chosen because she was the lightest in the stable,

heavier horses having been used the three previous winters, but the result was the same. She weighed 1,055 pounds at the beginning of the experiment and exactly 1,100 pounds at the end. A little trouble was experienced with her, because she refused to eat the swedes, and molasses had to be used to make her take the roots. She liked carrots very well, and she ultimately had to be given them instead of turnips. This shows that carrots are *the* roots for horses, and that, when at all possible, they should be grown for this purpose instead of swedes.

During the 151 days, the mare ate the following quantities of feed:—

FEED eaten during 153 days by an idle mare weighing 1,055 pounds.

Feed.	Quantity.	Price per ton.	Price per pound.	Cost.
	Lb.	$	cts.	$ cts.
Rough hay	1,530	7 00		5 35
Oat straw	1,332	4 00		2 66
Swedes	654	2 00		0 65
Carrots	336	2 00		0 34
Oats	213		1·5	3 20
Bran	12		1·0	0 12
Molasses	66		2·0	1 32
Total cost				13 64

This mare had to be worked hard until the experiment commenced, on November 1, 1914, so that oats and bran were given to her for a month, as the work was gradually decreased. And right here, it is well to say that this is essential: to slowly cut down the work and feed in the autumn and increase both, little by little, in the spring.

The following table may be interesting, as it shows the results of four years:—

COST of wintering idle horses—Summary of four years.

Winter.	Length of experiment.	Weight at beginning.	Weight at end.	Gain in weight.	Loss in weight.	Cost of feed.
	Days.	Lb.	Lb.	Lb.	Lb.	$ cts.
1911-12	152	1,375	1,395	20		16 25
1912-13	151	1,350	1,445	95		16 96
1913-14	151	1,150	1,135		15	10 99
1914-15	151	1,055	1,100	45		13 14
Average for four years	151	1,232	1,269	37		14 33

From the above it will be seen that horses weighing around 1,250 pounds can be fed, idle, for a little less than 10 cents per day, on a pound each of rough hay, oat straw, and carrots or swedes, per hundred pounds live weight, valuing the above feeds respectively at $7, $4, and $2 per ton.

By " rough hay " is meant hay made in good shape, not musty or mouldy, but from any grass or weed which horses will eat.

CAP ROUGE.

COST OF RAISING HORSES.

Feed of a Yearling.

It is well to say here that in calculating the cost of raising horses, only the feed of the youngsters is taken into account, nothing being allowed for feed or care of dam, stallion fees, care of colts, interest, depreciation, or housing. And it must also be remarked that no attempt is made to see how cheaply a young horse can be kept, but, on the contrary, every possible effort is made to develop the colts as rapidly as possible, as there seems no doubt that it is the only way to assure proper growth and usefulness for the future.

Last year, all feed given to a colt dropped on May 31, 1913, was weighed, and the total cost, until April 1, 1914, was $27.51. During the following twelve months, this young stallion ate the following quantities of feed:—

FEED eaten from April 1, 1914, to March 31, 1915, by a yearling Stallion.

3,030 pounds hay at $7 per ton	$10 60
2,261 " oats at 1½ cents per pound	33 91
1,564 " bran at 1 cent per pound	15 64
91 days pasture at $1 per month	3 03
Cost for one year	$63 18
Total cost, when 22 months old	$90 69

During the year, the colt gained 340 pounds, or nearly 1 pound per day. He was away about three weeks at exhibitions, where he fretted very much, and there is no doubt that he could have gained the pound per day had he remained quiet in his paddock. At 10 months, he weighed 735 pounds, and at 22 months, 1,075 pounds. This latter weight is about the average for his sire and his dam, so that he will tip the scales, when mature, at from 150 to 200 pounds more than they. This colt was raised outside and has never been in the barn, except two weeks at exhibitions, having only a shed for shelter during the winter. This probably took more feed, but it kept the limbs in good shape, which would have been well nigh impossible, with the high feeding, had he been kept tied up, or even in a box stall.

Feed of two Weanlings.

So as to get more data on this question of the cost of raising horses, all the feed given to two weanlings was weighed. Both of these are males. One was dropped on June 11, and the other on July 31, 1914. On March 31, 1915, they had eaten the following quantities of feed:—

1,693 pounds hay at $7 per ton	$ 5 92
1,115 " oats at 1½ cents per pound	16 73
590 " bran at 1 cent per pound	5 90
430 " whole milk at 1½ cents per pound	6 45
3,024 " skim-milk at ⅕ cent per pound	6 06
Total cost	$41 06

These colts weighed respectively 115 and 110 pounds at birth; at 5 months, when they were weaned, the first weighed 600 pounds and the second 562 pounds; and on March 31, 1914, one was 290 days old and weighed 725 pounds, whilst the other was 240 days old and weighed 680 pounds. It is remarkable to note that, last year as well as this year, it cost about 18 cents per day to feed a colt from the time he was weaned, at 5 months, until March 31 following.

The feed of the yearling, and also that of at least one of the weanlings will be again all weighed until April 1, 1916.

CAP ROUGE.

EXPERIMENTAL HOUSING OF HORSES.

During the last three winters, five different colts have been kept outside, under single-boarded sheds, and the temperature went down as low as 31° F. below zero. Not one of these colts seemed to suffer from the cold, and they all seemed bright every day of the year. Colts will be wintered thus outside during the next few years, but this way of keeping them can be recommended even now, for our district. That it takes a little more food to keep up the necessary warmth cannot be denied, but against this, and more than balancing up the extra cost, is the good constitution of the horses, without which it is folly to expect success.

SELLING HIGH CLASS BREEDERS AT A REASONABLE COST.

The eleven mares and fillies at this Station are, it is admitted by all live stock men, the best stud of French Canadians in existence at any one place to-day. With them, half a dozen colts and fillies can be raised each year and sold as breeders at a reasonable cost. In choosing them, size and weight were taken into consideration, as long as the required type was there. The object is to raise horses weighing between 1,200 and 1,300 pounds, which will be hardy, of strong constitution, quick yet docile, good on the farm and on the road. It is not expected that they will replace the draughters for very heavy work, nor the roadsters for driving, but it seems that there must be a place for a general-purpose breed on the average small farm of the country, and this place cannot better be filled than by the French Canadian horse.

Cap Rouge.

EXPERIMENTAL STATION, LENNOXVILLE, QUE.

REPORT OF THE SUPERINTENDENT, J. A. McCLARY.

HORSES.

This Station now owns eighteen horses, three of which are imported registered Clydesdale mares, three Canadian-bred registered Clydesdale mares, one registered Clydesdale foal dropped September 1, 1914, ten well graded Clydesdale work horses, and one driving horse.

Four of these mares were bred in the fall of 1914 with the object of raising fall colts, the fall being considered the most profitable time of the year for farmers, owing to the small amount of horse labour required through the fall and winter months compared with the labour through the spring and summer months, when the work of these brood mares is very essential. Unfortunately, none of these mares has proved in foal, but the same line of work will be undertaken this coming year.

The horses came through the winter in very good condition, with no sickness whatever, and have done the spring work with no sore shoulders or blemishes.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

HORSES.

The horses on this Farm consist of the following: Fourteen heavy farm horses, including two registered Clydesdale mares; two light horses for driving; one three-year-old colt.

No colts have been raised during the year, but some of the mares have been bred in the hope of raising colts next year.

CLASSIFICATION OF LABOUR.

The labour performed by the horses during the year has been divided as follows: Farm work (regular), 12,420 hours; Farm work (experimental), 10,040 hours; horticulture, 1,050 hours; roads, 580 hours; drawing feed, 1,370 hours; drawing manure, 1,840 hours; messenger service, 3,030 hours.

PURCHASE OF CLYDESDALE MARES.

In the fall of 1914 two registered Clydesdale mares were purchased. They were 3 and 4 years, and the older one is in foal. They are good representative specimens of the breed, and were raised by a Manitoba breeder.

WINTERING HORSES OUTDOORS.

Six of the horses were turned out-of-doors in the winter. They had a little open shed for their only shelter. They were fed as much good hay as they would clean up, and one gallon of oats each per day. They seemed to feel the cold somewhat for a few days when the first cold snap came, but after that they seemed to be perfectly contented all winter.

The total weight of the six horses when they were turned out was 8,730 pounds. When they were taken in this spring they weighed 9,035 pounds. This makes an average gain of a little over 100 pounds per horse. They came in in first-class condition for work. The horses that were turned out were the ones most inclined to have foot trouble or to stock up in the legs when standing in the stable during the winter. They were absolutely free from anything of this sort, and came in with their feet and legs in good condition.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE ASSISTANT TO THE SUPERINTENDENT. K. MacBEAN, B.S.A.

HORSES.

At the Experimental Farm at Indian Head there are at present eighteen horses, consisting of six work mares, four brood mares, four geldings, two filly foals, and two old drivers. Previous to this year the horses were used solely for farm work, but now that the raising and handling of live stock is receiving increased attention at this Farm, horse-breeding has been added to the many important phases of the work with stock.

With "breed from the best" as the watchword, only four out of the ten mares have been selected for breeding purposes. Three are pure-bred Clydesdales, while the fourth is a grade of the same breed. Two have been on the Farm for some years, but the other two were purchased from Alex. Mutch, Esq., of Lumsden, Sask., only last April.

Out of four foals, two are being raised. Of those lost, one was a weakling, while the other died of navel ill. This disease seems to be a scourge in this part of the country. One of the mares bought last spring has proved a very profitable investment, as her filly foal is a splendid type of Clydesdale.

With this latter mare and her filly as examples of an ideal, this Farm hopes to further the interest of draught-horse breeding very materially in the future.

Besides that of horse-breeding, considerable experimental work is being carried on during the winter months. Last year a number of tests were set on foot with a view to comparing different methods of feeding and handling the draught-horse in winter, and these have been continued this year.

The following table indicates the method of feeding and handling:—

Group.	Ration.	Method of Handling.		
		Light work.	Let out each day.	Stabled and Exercised.
1	Oat straw, oat sheaves, oats and bran	1	1	1
2	Oat straw, mixed hay, oats and ground flaxseed	2	2	2
3	Oat straw, mixed hay, oats and bran	3	3	3
4	Oat straw, alfalfa hay, oats and bran	4	4	4

The horses bracketed under "light work" and those under "stabled and exercised" were handled together in respective two-horse teams. Both the former teams were at work every day this winter, while the latter were exercised also daily with the exception in both cases of only one or two stormy days. The remaining four horses were, weather permitting, turned into a field every afternoon, where they took exercise at will.

During the experiment, which lasted for four months, the rations were weighed periodically and the horses monthly.

In the feeding of the horse, not only the animal's weight but his individuality also was recognized. In the latter connection, especially, very pronounced peculiarities were observed.

The following outline gives the amounts that were fed, the basis being that an idle horse should just get about half the feed given when at regular work. It may also be observed that those working were fed very lightly, as their work was not heavy.

Group 1.—Straw, oat sheaves, oats, and bran.

Morning.—Oat sheaf.

Noon.—Oats, one-half gallon; bran, one-quarter gallon; oat straw, 3 to 5 pounds.

Evening.—Oat sheaf.

NOTE.—The horses fed this ration did not relish it at the outset, but results go to show that an idle horse can thrive well thereon, providing he is fed good substantial feed soon enough to put him in heart for the spring work. Such a feed as the foregoing without the addition of bran would, however, be undesirable.

Group 2.—Straw, mixed hay, oats, and ground flaxseed.

Morning.—Oats, half gallon; ground flaxseed, 1 handful; hay, 3 to 6 pounds.

Noon.—Oats, half gallon; ground flaxseed, 1 handful; oat straw, 3 to 5 pounds.

Evening.—Oats, half gallon; ground flaxseed, 1 handful; hay, 3 to 6 pounds.

NOTE.—This ration, owing to the presence of flaxseed, kept the horses up in good condition, but care has to be exercised at all times to feed only a small amount, owing to its laxative effect, while occasionally one meets with a horse that will scarcely eat it. Such was our experience with horse No. 2 of this group.

Group 3.—Straw, mixed hay, oats, and bran.

Morning.—Oats, half gallon; bran, quarter gallon; hay, 3 to 6 pounds.

Noon.—Oats, half gallon; bran, quarter gallon; oat straw, 3 to 5 pounds.

Evening.—Oats, half gallon; bran, quarter gallon; hay, 3 to 6 pounds.

NOTE.—Results herein go to prove that this ration is a very satisfactory one.

Group 4.—Straw, alfalfa hay, oats, and bran.

Morning.—Oats, half gallon; bran, quarter gallon; alfalfa hay, 2 to 5 pounds.

Noon.—Oats, half gallon; bran, quarter gallon; straw, 3 to 5 pounds.

Evening.—Oats, half gallon; bran, quarter gallon; alfalfa hay, 2 to 5 pounds.

NOTE.—Alfalfa was found to be a desirable constituent when fed under the conditions outlined, but a less amount should be fed than would be of mixed hay.

The most expensive ration was that in which flaxseed was fed, while that containing alfalfa hay followed next. The ration composed of mixed hay, oat straw, oats, and bran was the cheapest, due, no doubt, to the fact of there being less waste with it than with that in which oat sheaves were included. The latter came third in order of expensiveness.

The average cost per day per horse was, of course, low in each group, for the reason that the horses were fed as lightly as possible in consideration of the fact that the aim was economical feeding.

The average weight of the horses in these tests is 1,600 pounds, while, with the foregoing method of handling and feeding, they were carried through the winter in a very satisfactory manner.

This work will be carried on for some time yet, with a probable addition of other useful experiments.

INDIAN HEAD.

EXPERIMENTAL STATION, SCOTT, SASK.

REPORT OF THE ACTING SUPERINTENDENT, M. J. TINLINE, B.S.A.

HORSES.

On the Scott Experimental Station there are at present eleven work horses, four grade Clydesdale colts, and one driver. Two of the colts are 3 years old and have been broken in during the past month. Two of the work horses have been purchased this past winter.

HORSE FEEDING EXPERIMENTS.

The cost of wintering horses is an important item in the yearly expenditures of the farmers of Western Canada. Large numbers of horses are required during the summer months, while but few are needed for the winter work.

One phase of the experimental work with horses on this Station has consisted of an investigation into the cost of wintering idle farm horses. Five heavy draught horses were turned out to pasture on the prairie during the day and stabled at night. Two other horses were kept in the stable and given, on an average, about one hour's exercise each day, either in harness or in the paddock.

The roughage for all horses was oat straw. The horses that were feeding on the prairie only received straw at the evening meal. The horses that were in the stable received straw three times per day. Both lots received oat chop morning and evening. Water was given before feeding the grain. On two evenings each week, boiled oats were substituted for the regular ration. The horses were given salt twice a week.

The experiment in wintering horses was conducted for four months.

COST OF WINTERING IDLE WORK HORSES.

LOT 1.—ON PASTURE DURING THE DAY, STABLED AT NIGHT.

Number of horses in experiment		5
Weight at beginning of experiment, December 1	Lb.	7,925
Weight at termination of experiment, March 31	"	7,760
Total loss in weight in 121 days	"	165

COST OF FEED.

Oat chop—5,257 pounds at $1\frac{1}{2}$ cents per pound	$	78 85
Oat straw—4,000 pounds at $2 per ton	"	4 00
Total cost for 121 days	$	82 85
" per horse for 121 days	"	16 57
Cost per horse per day	Cts.	13·5

NOTE.—The horses in this test were heavy draught eastern horses. Previous to the winter of 1913-14 they were not accustomed to feeding on the prairies.

LOT 2—KEPT IN THE STABLE.

Number of horses in experiment		2
Weight at beginning of experiment, December 1	Lb.	2,680
Weight at termination of experiment, March 31	"	2,680

COST OF FEED.

Oat chop—1,677 pounds at $1\frac{1}{2}$ cents per pound	$	25 15
Oat straw—6,000 pounds at $2 per ton	"	6 00
Total cost for 121 days	$	31 15
" per horse for 121 days	"	15 57
Cost of feed per horse per day	Cts.	12·8

INVESTIGATIONS AS TO THE COST OF RAISING HORSES.

In the investigation as to the cost of raising horses, two colts rising 3 years old, one colt rising 2 years old, and one weanling have been used. In securing the following data it has been considered advisable to commence keeping a record of the feeds consumed at the time when the foals are weaned. It will also be noted that the cost of feeds during the past season has been exceptionally high, and that the actual cost of raising each of the 3-year-old colts has only been $56.24. The sum total cost of feeding each yearling, 2-year-old, and 3-year-old colt for the past season has amounted to $71.96, fed liberally on the feeds given in the following table:—

COST OF FEEDING COLT RISING 1 YEAR OLD.

The colt in this experiment was weaned when 5 months old. From date of weaning, which was on November 15, till March 31, all the feed given this colt was carefully weighed. The following table gives the amounts, and the cost of the food consumed:—

Weight at beginning of experiment, November 15	Lb.	623
Weight at termination of experiment, March 31	"	725
Total gain in weight in 136 days	"	102
Gain in weight in 1 day	"	.75

COST OF FEED.

Oat chop—340 pounds at 1½ cents per pound	$	5 10
Bran—136 pounds at 1¾ cents per pound	"	2 38
Prairie hay—668 pounds at $10 per ton	"	3 34
Red clover—408 pounds at $10 per ton	"	2 04
Alfalfa—315 pounds at $12 per ton	"	1 57
Total cost for 136 days	$	14 43
Cost for 1 day	Cts.	10.6

NOTE.—The colt was turned out regularly in the paddock for a few hours every day, excepting a few stormy days when it was allowed the run of a box stall in the barn. While not overly fat, the colt continued healthy throughout the entire winter.

COST OF FEEDING COLT RISING 2 YEARS OLD.

This colt was stabled at night during the spring of 1914, and was allowed to run in the pasture during the day. During the summer it was in the pasture day and night, receiving no grain whatever. Early in November it was brought into the stable and fed liberally of the feeds given in the following table:—

Weight at beginning of experiment, April 1, 1914	Lb.	532
Weight at termination of experiment, March 31, 1915	"	1,000
Total gain in weight in 365 days	"	468
Gain in weight in 1 day	"	1.28

COST OF FEED.

Oat chop—736 pounds at 1½ cents per pound	$	11 04
Bran—153 pounds at 1¾ cents per pound	"	2 67
Prairie hay—1,183 pounds at $10 per ton	"	11 83
Alfalfa—385 pounds at $12 per ton	"	2 31
Pasture—6 months at $1 per month	"	6 00
Total cost for 365 days	$	33 85
Cost for 1 day	Cts.	9 33

NOTE.—For several hours each day, this colt was turned out in the paddocks for exercise.

SCOTT.

COST OF FEEDING COLTS RISING 3 YEARS OLD.

These colts ran in the pasture during the summer, and were brought into the stable at night after November 5. They ran out in the pasture during the day throughout the entire winter until March 1, when they were kept in and broken to the harness.

Number of colts in experiment		2
Weight at beginning of experiment, April 1, 1914	Lb.	1,835
Weight at termination of experiment, March 31, 1915	"	2,310
Total gain in weight in 365 days	"	475
" " per colt per day	Cts.	.65

Cost of Feed.

Oat chop—1,778 pounds at 1½ cents per pound	$	26 67
Hay—741 pounds at $10 per ton	"	3 70
Straw—1,000 pounds at $2 per ton	"	1 00
Pasture—8 months at $1 per head per month	"	16 00
Total cost for 365 days (two colts)	$	47 37
" 365 " (one colt)	"	23 68
Cost per colt per day	Cts	6.08

SUMMARY OF COST OF RAISING COLTS UP TO 3 YEARS OF AGE.

From time of weaning until 1 year old	$14 43
" 1 to 2 years old	33 85
" 2 to 3 years old	23 68
Total cost to 3 years old	$71 96

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

HORSES.

The horses at the Lacombe Station number twenty-one head. There are in all thirteen mares, two pure-bred Percherons, four pure-bred Clydesdales, and seven grade Clydesdales. Only one of the draught mares produced a foal in 1914, and this was unfortunately lost (being killed probably by a timber wolf). Of the mares bred in 1914 two are in foal. All of the horses not in use during the winter ran out, and for the eight weeks prior to March 31 were fed green sheaves. The cost per head of wintering these mares during the early part of the winter, when only straw was fed, was $1 per month; when in addition to the straw, two bundles of green sheaves were fed each animal per day, the cost has been $2.50 per month. The animals so wintered have come through in fair condition as to flesh, and in perfect health.

The cost of carrying three yearling fillies from April 1, 1914, to March 31, 1915, is given in the following table:—

Cost of carrying Three Fillies, 1 year old in the Summer of 1914, from April 1, 1914, to March 31, 1915.

Gross weight, April 1, 1914	Lb.	2,160
8,150 pounds green feed at $10 per ton	$	40 75
2,400 pounds hay at $10 per ton	"	12 00
45 bushels oats at 1 cent per pound	"	15 30
200 pounds chop at 1 cent per pound	"	2 00
600 pounds bran at $1.60 per cwt	"	9 60
5 months pasture at $1 per month per head	"	15 00
Combined weight, March 31, 1915	Lb.	3,520
Total gain	"	1,360
Average gain	"	453
Average gain per day	"	1·24
Cost of 1 pound gain on 1-year-old fillies	Cents.	6·95

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

Since the force of horses has been kept for working purposes only, no experiments have been made with them. Careful figures have been kept as to the cost of maintaining a work horse, and these are given below.

The food for the year for the whole force of horses averaged 16 pounds of clover hay per head per day, and 11·41 pounds of grain. The grain was made up of four-fifths home-grown peas, oats, and barley, and one-fifth wheat bran. During the winter each horse ate 4 pounds of either carrots or mangels each day. The horses were never very fat, but they were always in first-class working condition. The average cost for all the horses was as follows:—

Grain, 4,164·65 pounds at 1·3 cent	$ 54 14
Clover hay, 5,840 pounds at ·5 cents	29 20
Roots, 800 pounds at 2 cents	1 60
Total	$ 84 94

The heaviest horses (over 1,800 pounds) consumed food in the year as follows:—

Grain, 4,562·5 pounds at 1·3 cent	$ 59 31
Clover hay, 6,570 pounds at ·5 cent	32 85
Roots, 800 pounds at .2 cent	1 60
Total	$ 93 76

The lightest horses (under 1,500 pounds) worked less and cost less, as follows:—

Grain, 3,766 pounds at 1·3 cent	$ 48 95
Clover hay, 5,110 pounds at ·5 cent	25 55
Roots, 800 pounds at ·2 cents	1 60
Total	$ 76 10

A driving pony, which was very fat and which was never overworked, did not cost very much to keep in food. She is, however, very hardy and an exceptionally easy keeper. Her account is as follows:—

Grain, 1,460 pounds at 1·3 cent	$ 18 98
Clover hay, 2,920 pounds at .5 cent	14 60
Roots, 800 pounds at ·2 cent	1 60
Total	$ 35 18

For a few nights only, at midsummer, the horses were allowed out to pasture. This small amount of food is not charged against them. On a farm such as this, where pasture is extremely scarce, we do not consider it good policy to let the horses out. If we had a good paddock of permanent grass, however, some benefit might be gained by cheapness of feeding. As the nights are always cool, the horses would rest well and do better in the stable.

The horses were kept at work through the whole year; in summer at the regular field work, in winter at roadmaking, winter ploughing and cultivation, land-clearing, and breaking. Two of the old horses, which were worn out, were destroyed and three colts were bought at the close of the year. This gives us a total force of two pure-bred Clyde mares 4 years old, three mature heavy-draught grade Clydes, two mature light-draught grades (old), three heavy-draught colts 3 years old, one general purpose mare, and one light driving mare; a total of twelve horses.

SHEEP.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN, E. S. ARCHIBALD, B.A., B.S.A.

BREEDING SHEEP.

There are now ninety-eight pure-bred sheep in the flocks. Two breeds only are kept, namely, Shropshires and Leicesters.

The Shrophires include seventy-one head, made up of three rams, twenty-four aged ewes, thirteen shearling ewes, nineteen spring ewe lambs, and twelve spring ram lambs.

The Leicesters include twenty-seven head, made up of three rams, seventeen aged ewes, and seven shearling ewes.

Again only a fairly successful year can be reported in the breeding operations with sheep. The lamb crop in the spring of 1914 was very good, namely, 129 per cent reared. During the past fiscal year both ewes and lambs did particularly well until midsummer. Limited as they were to the 2 acres of pasture contained in the 6-acre sheep rotation, the pasture lasted but a short time. The experiment of keeping the sheep on the Farm roadsides, to ascertain their influence on keeping the roadsides clean, as well as to ascertain the cost of attention for this method of pasturing, was continued. Although it has proven somewhat more expensive than ordinary methods of pasturing, yet the added weight of the lambs and the improved condition of the ewes would appear to warrant this method if the flock were two or three times its present size.

I am pleased to report that during the past year the ewes and lambs were attacked only to a very slight extent with tape worms and stomach worms. Only a few of the late lambs showed any effects from the presence of these parasites, and these were successfully treated and have made a fair recovery. The treatment reported in the last annual report was the one most successful in eliminating these parasites.

SHEEP FEEDING EXPERIMENT NO. 1.

ELEVATOR SCREENINGS FOR THE FATTENING OF LAMBS.

In the fall of 1914, eighty ewe and wether lambs of grade breeding and uniform size were purchased for delivery at the Central Experimental Farm during the first two weeks of October. These lambs were dipped a few days after their arrival and, together with the pure-bred ewe lambs of the Farm flock, were divided into six lots for experimental feeding.

Analysis of Elevator Screenings.

The following botanical analyses were supplied by the seed commissioner.

A composite sample of 6,000 tons of elevator screenings gave the following separations: 37 per cent scalpings, 7 per cent succotash flax, 18 per cent buckwheat screenings, 38 per cent black seeds.

Scalpings.—65 per cent wheat; 25 per cent other grains, 3 per cent weed seeds; 7 per cent straw and chaff. Considered excellent feed—no immediate need to investigate its value.

Succotash flax.—30 per cent flax; 40 per cent broken wheat; 15 per cent weed seeds, chiefly wild buckwheat, lamb's quarters, and wild oats; 15 per cent chaff.

Buckwheat screenings.—58 per cent wild buckwheat; 29 per cent broken wheat, oats, and flax; 9 per cent weed seeds; 4 per cent chaff.

Black seeds.—Before analysing this material a separation was made of it by means of the 1/25-inch perforated zinc sieve.

The 38 per cent black seeds was thus separated into 7 per cent which passed through the 1/25-inch sieve, and 31 per cent above it.

Of the portion passing through the 1/25-inch sieve, 22 per cent was tumbling mustard, 63 per cent dust, 10 per cent lamb's quarters, and 5 per cent other weed seeds.

Of the portion passing over the 1/25-inch screen, 53 per cent was lamb's quarters, 3 per cent wild mustard, 8 per cent other mustard, 9 per cent other weed seeds, and 27 per cent chaff.

Object of Experiment.

1. To illustrate the value of a well-balanced grain ration in lamb fattening work.
2. To compare this with elevator screenings.
3. To determine the value of elevator screenings alone.
4. To determine the value of elevator screenings less black seeds.
5. To illustrate the feasibility of feeding black seeds alone where possible.
6. To increase the palatability of black seeds by an addition of Caldwell's molasses meal.

Weights.

During the experiment each lamb was weighed individually. The original weights taken on the day the lambs arrived were considered as the buying weights. After the preparatory feeding period the lambs were weighed into the experiment, and further individual weights taken at two-week intervals from the start until the completion of the experiment.

Feeding (preparatory period).

During the first two weeks all of the lambs were fed the same ration, which in this case consisted of a certain amount of pasture; and when fed in-doors, the same quantity of hay as they later received during the experiment, together with ½ pound each of the grain ration which was used in lot 1 during the experiment, that is: Oats, 2 parts; bran, 2 parts; oil cake, 1 part.

Roughages.

All lambs were fed the same quality and quantity of roughage. The hay consisted of mixed clover and timothy, and, for part of the experiment, of alfalfa hay fed at the rate of 1½ pound per lamb per day. The succulent roughage throughout the period consisted of corn ensilage and pulped turnips, equal parts, mixed, fed at the rate of from 4 to 7 pounds per lamb per day.

Grains.

The following indicates the method of division of the lambs for the experimental feeding period:—

Lot 1 received a grain mixture composed of: Oats, two parts; bran, 2 parts; oil cake, 1 part.

Lot 2 received one part of the above mentioned mixture mixed with one part of complete elevator screenings.

Lot 3 received complete ground elevator screenings.

Lot 4 received complete ground elevator screenings less the black seeds usually contained therein.

Lot 5 received ground black seed.

Lot 6 received ground black seed, two parts; Caldwell's molasses meal, two parts.

Plan of Feeding.

The grain mixture for each lot was fed first and followed by the roughage. Each lot received its special grain mixture throughout the whole period. It was planned to feed meals in the quantity given below. However, with certain of the rations which proved unpalatable this schedule could not be followed. The actual quantities eaten will be found in the experimental tables, the portion removed daily from each pen being credited to that particular lot.

First week, 8 ounces per lamb per day.
Second " 10 " "
Third " 12 " "
Fourth " 14 " "
Fifth " 16 " "
Sixth " 18 " "
Seventh " 18 " "
Eighth week, until the completion of the experiment, 20 ounces per lamb per day.

Values of Feeds.

Standard meal mixture—1·4 cent per pound.
Complete pulverized screenings—$10 per ton.
Screenings, less black seeds—$12 per ton.
Black seed—$4 per ton.
Caldwell's molasses meal—$34.50 per ton.
Hay—$7 per ton.
Roots and ensilage—$2 per ton.

SHEEP FEEDING EXPERIMENT No. 1.—Elevator Screenings for the Fattening of Lambs.

Lot.		1.	2.	3.	4.	5.	6.
Feed given.		Meal.	Meal and screenings.	Screenings.	Screenings less black seeds.	Black seeds.	Black seeds and molasses meal.
Number of animals in each group		21	20	20	20	20	20
First weight, gross	lb.	1,602	1,677	1,485·5	1,468·5	1,741·5	1,492
First weight, average	"	76·3	83·9	74·3	73·4	87	74·9
Finished weight, gross	"	2,014	2,120	1,770	1,879	2,083	1,747
Finished weight, average	"	95·9	106	88·5	93·9	104·1	87·3
Number of days in experiment	days	70	70	70	70	70	70
Total gain for period	lb.	412	443	284·5	410·5	341·5	255
Average gain per animal	"	19·6	22·1	14·2	20·5	17·1	12·7
Average daily gain for group	"	5·8	6·3	4·0	5·8	4·8	3·6
Average daily gain per animal	"	0·28	0·31	0·2	0·29	0·24	0·18
Quantity meal eaten by group for period	"	1,442	1,383	892	1,298	650	1,383
Quantity hay eaten by group for period	"	2,205	2,100	2,100	2,100	2,100	2,100
Quantity roots and ensilage eaten by group for period	"	8,416	7,980	7,140	5,900	7,690	7,030
Total cost of feed	$	36·31	27·46	19·95	22·27	16·34	27·51
Cost of feed per head	$	1·72	1·37	0·99	1·11	0·82	1·38
Cost of feed per head per day	$	0·024	0·019	0·014	0·016	0·012	0·019
Cost to produce 1 pound gain	$	0·088	0·062	0·07	0·054	0·048	0·108
Original cost of animals at $7.40 per cwt	$	118·54	124·09	109·92	108·66	128·87	110·40
Original cost plus cost of feed	$	154·85	151·55	129·87	130·93	145·21	137·91
Selling price at $8.25 per cwt	$	166·15	174·90	146·02	155·01	171·84	144·12
Net profit per group	$	11·30	23·35	16·15	24·08	26·65	6·21
Net profit per animal	$	0·54	1·16	0·80	1·20	1·33	0·31

OTTAWA.

The most striking fact revealed by a study of the foregoing table is the relatively low cost of feed, with the consequent low cost per pound gain, when the standard meal ration is compared with those containing various grades and percentages of elevator screenings. In this connection it might be mentioned that the lot receiving the standard ration were pure-bred lambs and were not nearly as uniform as were the remaining lots; that is, some were late lambs, others, through untoward circumstances, not so well developed as they should have been. Lots 2, 3, 4, 5, and 6, however, were uniformly high grade and, in the initial separation into groups, the idea of group uniformity was still further accentuated. The pure-bred lambs had been accustomed to a well-balanced ration with limited range, and were in good flesh; the grades, while in excellent condition, were spare and just off the pastures, where in all probability they received little grain. In short, the grade lambs were in better condition to show rapid gains than were the pure-breds.

Palatability of Rations.

As to the palatability, or, from the lamb's point of view, the desirability, of the grain ration, lot 1, of course, consumed their meal in whatever quantity fed, from the start.

With the exception of a few pounds removed during the first few days, the same might be said of lot 2, receiving equal portions of the standard ration and pulverized screenings.

With lot 3, during the first twelve days, practically the entire ration was removed daily, and from then on in lesser quantities, until at the end of four weeks, it was being consumed cleanly. That this was done more or less under protest, however, was shown by the lambs, after eating the ration for about a week, refusing from one-third to one-sixth of it daily throughout the remainder of the experiment.

Lot 4, fed pulverized screenings with black seeds removed, after the first two weeks consumed their meal cleanly throughout the experiment, apparently with relish.

Lot 5, on pulverized black seed, refused their ration almost entirely for five weeks, and at the conclusion of the experiment were consuming about half the quantity fed, which portion disappeared only after very apparent effort and dislike.

Lot 6, on equal portions of pulverized black seed and molasses meal, consumed their ration cleanly from the start, showing a strong liking for it, the molasses meal apparently quite effectually neutralizing the undesirable flavour and nature of the undiluted black seed.

Texture of Pulverized Screenings.

The nature of the by-product, aside from flavour, in all its grades, was such as to render it unpalatable to sheep, the screenings being so finely pulverized as to be of a dust-like consistency. This fine pulverization was necessary to guard against possible spread of noxious weed seeds.

Health of Lambs.

No toxic effect was noticed from the use of the by-product in any of its grades; in fact, the health of the lambs was excellent throughout, barring, of course, a few isolated cases of scours, not necessarily due to the nature of the ration, and easily controlled by simple remedies.

Comparing the results from the standpoint of total gains, the following is the result:—

First Lot 2.—(Screenings, standard meal, equal parts.)

Second Lot 1.—(Standard meal.)

Third Lot 4.—(Screenings with black seeds removed.)

Fourth Lot 5.—(Black seed.)

Fifth Lot 3.—(Pulverized screenings complete.)

Sixth Lot 6.—(Black seed, molasses meal, equal parts.)

Comparing from the standpoint of cost to produce 1 pound gain, the following is shown:—

First Lot 5.—(Black seeds.)

Second Lot 4.—(Screenings, black seeds removed.)

Third Lot 2.—(Standard ration, screenings, equal parts.)

Fourth Lot 3.—(Complete pulverized screenings.)

Fifth Lot 6.—(Black seed, molasses meal, equal parts.)

Sixth Lot 1.—(Standard meal.)

Referring to the first comparison, the results are what might have been anticipated. Lot 2 were rangier and better feeding lambs than Lot 1, and although they received a ration less nutritious and palatable, were in a position to make more telling use of their food. Lot 2 on the standard well-balanced ration, although lacking in uniformity and general condition, should have been in either first, or at least second, place. Lot 2 in third place had consumed what should have been the most desirable screenings ration. Lot 5, however, consumed the least desirable ration of all, yet were able to make better gains than lots 3 and 6 on complete screenings and black seed plus Caldwell's molasses meal, equal parts, the latter two coming in the order given, fifth and sixth respectively. Why this should be the case is difficult to explain, considering the comparatively small portion of the black seed ration eaten. While the supposition may, perhaps, scarcely be warranted, it would appear that this refusal to partake of the black seed was, in reality, their salvation, knowing that lot 3 on a ration containing a proportion of black seeds, and lot 6 on black seeds and molasses meal both stood lower; in other words, that better gains would have been made by eliminating black seeds entirely, and that while its presence might be counteracted from the standpoint of palatability, its undersirable propensities still remained active. It should be noted, too, that lot 5 (black seeds) consumed considerably more ensilage and roots than did either lots 3 or 4.

From the cost-to-produce standpoint of comparison, the rather remarkable results may at least in part be explained by the comparatively low valuation placed on the elevator by-products. This fact may partially explain the high standing of black seeds and the poor showing of the well-balanced ration. Black seeds with molasses meal, which it will be remembered was a palatable mixture, is the only ration having the unenviable consistency of occupying the same position in both comparisons.

Another important point in sheep feeding work was disclosed, namely: The value of a well-balanced, palatable roughage ration, especially in the earlier months of a feeding period. In this experiment, when in the case of the lambs receiving a by-product ration, particularly lots 3 and 5, the meal proved more or less unpalatable, the greatest gains were made after the fourteenth and up to the fiftieth day. After the fiftieth day gains were small, particularly in the case of the lambs receiving a ration containing blackseeds, lot 3 being practically at a standstill, and lots 5 and 6 actually losing in weight. This would indicate that from the fourteenth day, or when the lambs were

consuming a fair ration of ensilage, roots, and hay, and up to the fiftieth day, approximately, the excellent roughage ration they received enabled them to produce economically with very little meal, and that of an unpalatable nature.

Further interesting comparative facts and figures are hereby deduced, and while they are correct as far as the actual data are concerned, the effect of the factors already discussed must not be forgotten.

1. Comparing standard meal (lot 1) with lot 2, it is seen that with the valuation of other feeds in this mixture, 691 pounds of complete elevator screenings has a value equal to 851 pounds meal, 259 pounds hay, and 1,025 pounds roots, or $39 per ton.

2. Comparing lot 1 and lot 3 it is seen that 1,442 pounds standard meal equals 1,248 pounds screenings, 735 pounds hay, and 1,500 pounds roots, at above valuation of $26 per ton.

3. Comparing lot 1 and lot 4 it is seen that 1,298 pounds screenings with black seeds removed is equivalent to 1,442 pounds meal, 105 pounds hay, and 2,516 pounds roots, or $36 per ton.

Note.—From these deductions where complete screenings are shown to be worth $26 and screenings with black seeds removed worth $36, the value of the removal of black seeds is apparent.

4. Comparing lots 3 and 4 it is seen that 1,298 pounds screenings with black seeds removed is equivalent to 1,248 pounds screenings, 750 pounds hay, and 4,096 pounds roots. The advisability of the removal of black seeds from the total screenings is again evident.

Similar deductions with periods V and VI are practically impossible. As has been pointed out, the effect of black seeds, whether fed pure or mixed with other meals, is detrimental, and that, with lot 5, the small quantity eaten was actually a detriment, the gains being due to the ensilage, roots, and roughage ration. Similarly with lot 6 the gains may be attributed to the roughage and molasses meal. In both instances the elimination of black seeds from the ration would have, in all likelihood, resulted in increased gains.

The results once more point to the advisability of the separation of black seeds from the screenings, and to the undoubted value of the screenings with black seeds removed, for sheep-feeding work.

Ottawa.

Finishing Period.

At the close of the regular experiment, or to be exact, one week after that time, a second feeding or finishing period was begun in which all the lots received the same meal mixture: Oats, two parts; bran, two parts; oil cake, one part.

SHEEP FEEDING EXPERIMENT NO. II.—Finishing Lambs for Market.

Lot.		1.	2.	3.	4.	5.	6.
Feed given.		All lots received regular meal ration.					
Number of animals in each group		21	20	20	20	20	20
First weight, gross	lb.	2,032	2,160	1,740	1,860	2,062	1,725
First weight, average	"	97	108	87	93	103	86
Finished weight, gross	"	2,369	2,370	2,108	2,190	2,536	2,124
Finished weight, average	"	113	118	105	109	127	106
Number of days in experiment	days.	55	55	55	55	55	55
Total gain for period	lb.	337	210	368	330	474	399
Average gain per animal	"	16	10·5	18	16·5	23·5	19·9
Average daily gain for group	"	6	3·8	6·7	6·6	8·6	7·2
Average daily gain per animal	"	0·28	0·19	0·33	0·33	0·43	0·36
Quantity meal eaten by group for period	"	1,444	1,305	1,305	1,305	1,305	1,305
Quantity hay eaten by group for period	"	1,733	1,650	1,650	1,650	1,650	1,650
Quantity roots and ensilage eaten by group for period	"	5,500	4,400	4,400	4,400	4,400	4,400
Total cost of feed	$	31·77	28·44	28·44	28·44	28·44	28·44
Cost of feed per head	$	1·51	1·42	1·42	1·42	1·42	1·42
Cost of feed per head per day	$	0·027	0·026	0·026	0·026	0·026	0·026
Cost to produce 1 pound gain	$	·094	0·135	0·077	0·086	0·06	0·071
Original cost of animals at $7.75 per cwt	$	157·48	167·40	134·85	144·15	159·80	133·68
Original cost plus cost of feed	$	189·25	195·84	163·29	172·59	188·24	162·12
Selling price at $8.50 per cwt	$	201·36	201·45	179·18	186·15	215·56	180·54
Net profit per group	$	12·11	5·61	15·89	13·56	27·32	18·42
Net profit per animal	$	0·57	0·28	0·79	0·67	1·36	0·92

In reviewing the results obtained through the medium of the foregoing table, the observations made in the preceding paragraph should be remembered. Comparing results from standpoint of total gains:—

First Lot 5.—(Black seeds.)

Second Lot 6.—(Black seeds, molasses meal, equal parts.)

Third Lot 3.—(Complete screenings.)

Fourth Lot 1.—(Standard ration.)

Fifth Lot 4.—(Screenings, less black seeds.)

Sixth Lot 2.—(Screenings, regular meal, equal parts.)

Lots 5, 6, and 3, receiving black seeds in various percentages, were all losing weight at the end of the regular experiment, having apparently reached their limit of production on a roughage diet supplemented by inferior meal. The pure-bred lambs of lot 1 having grown and improved in condition generally, during the regular experiment, were also in a position to make fair gains, while the grade lambs in lots 4 and 2 which had received the most desirable screenings rations previously, stand fifth and sixth respectively.

OTTAWA.

This period, therefore, while primarily intended to give a uniform finish to the lambs, further bears witness to the fact that the black seed-fed lambs were held back during the experiment, as evidenced by their very rapid comparative gains during the finishing period. In spite of the fact that many of the grade lambs were fed meal rations known to be unpalatable, and probably actually harmful, it is interesting to note that in April, at the conclusion of the finishing period, they sold for top price on the Toronto market.

FINANCIAL STATEMENT FOR SHEEP.

Below are submitted inventories and returns for sheep on the Central Experimental Farm during the year April 1, 1914, to March 31, 1915.

	April 1, 1914.		March 31, 1915.		Returns including sales.	Gross returns made up of increased value and sales and manure.
	No.	Value.	No.	Value.		
		$		$	$	$
Sheep, all breeds and ages......	81	1,866 00	98	2,517 00	1,371 43	2,022 43

Returns.

By increase in value of flocks....................................	$ 651 00	
Sales of breeding stock....................................	146 00	
Sales of feeding lambs....................................	1,033 33	
Sale of wool, 345 pounds at 18 cents..........................	62 10	
Manure, 130 tons at $1....................................	130 00	
Gross returns..		$ 2,022 43

Expenditures.

To Food consumed....................................	$ 705 00	
Feeding lambs purchased....................................	528 22	
Labour expended....................................	700 00	
Gross expenditures..		$ 1,933 22
Net balance from sheep..		$ 89 21

EXPERIMENTAL STATION, CHARLOTTETOWN, P. E. I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

BREEDING SHEEP.

The nine Leicester breeding ewes gave ten strong lambs in the spring of 1914. During the summer the flock, which had very limited pasture, did not do well, and in the autumn they were found to be very badly infested with internal parasites. They were freed from tape worms by a number of treatments with 1-dram doses of the oil of male shield fern in from 2 to 3 ounces of castor oil for each mature sheep, given after a twenty-four hour fast. The infestation of stomach worms has been much harder to deal with, as the area of sheep pasture at this Station is at present limited to one small field, and treatment has to extend over a long period of time as the larval stage in the sheep's body is practically immune to treatment with medicine. During the winter months the mortality from these parasites was high, and no effective treatment has yet been found except frequent changes of pasturage during the summer months, the sheep not being allowed again the same season on any of the fields they had previously fed over.

EXPERIMENT IN FATTENING LAMBS.

The experiment in fattening lambs was continued with five pens of eleven lambs each. The fifty-five lambs in the experiment cost, on an average, including feed previous to the commencement of the test, 5½ cents per pound, live weight. Prime lambs at the time sold as high as 6⅝ cents per pound live weight. Only light-weights were used this season, the average of all the lambs being 64½ pounds. The lambs were allowed to run on clover pasture for a few days after coming off the cars, before the experiment was started. From November 17, when the experiment was commenced, the lambs were fed as follows: Each lot received 2⅓ pounds of grain and 15 ounces of bran per day at the start, except pen V, which received the above quantity of bran and an equal amount of oil cake, the oil cake replacing a part of the grain mixture. The grain fed the lambs was fed whole and contained about nine parts of oats to one part of barley. The grain was increased by one-tenth pound per lot per day throughout the experiment. The bran was increased as needed up to 2½ pounds per pen per day. The oil cake fed to lot 5 was increased up to 2 pounds per day to the pen. The pens were made up as uniform in quantity as possible. The lambs were sold at auction, and the prices paid would indicate the buyer's judgment of the quality of the pens at the close of the experiment. The roughage fed the different lots was as follows:—

Lot 1 was fed clover hay.

Lot 2 was fed mixed clover and timothy hay and corn stover in the proportion of two parts hay to one part stover until February 8, when the stover was stopped.

Lot 3 was fed timothy hay and mangels.

Lot 4 was fed clover hay and roots.

Lot 5 was fed clover hay with the addition of oil cake mentioned above.

The lambs were dipped with Cooper's dip on November 25.

In calculating the cost of feeding, the following prices were charged: Roots and corn stover, $2 per ton; hay, $7 per ton; meal mixture and bran, $26 per ton, oil cake, $44.50 per ton.

TABLE I.—LAMB FATTENING EXPERIMENT.—Clover hay *versus* mixed hay, and corn stover *versus* timothy hay, and roots *versus* clover hay and oil cake.

Lot.		1.	2.	3.	4.	5.
Class of feed for lot.		Clover hay.	Mixed hay, corn stover.	Timothy hay, mangels.	Clover hay, roots.	Clover hay, oil cake.
Number of lambs in lot		11	11	11	11	11
Number of days in experiment		135	135	135	135	135
Total weight at beginning	lb.	695	691	695	694	695
Total weight at end	"	822	798	820	890	917
Gain during period	"	127	107	125	196	222
Gain per head	"	11·5	9·7	11·3	17·8	20·1
Gain per head per day	"	0·085	0·071	0·084	0·132	0·149
Quantity of meal eaten by lot	"	1,182	1,129	1,122	1,182	1,016
Quantity of oil cake eaten by lot	"					235
Quantity of clover hay eaten	"	2,182			2,228	2,255
Quantity of mixed hay eaten	"		1,778			
Quantity of timothy hay eaten	"			2,034		
Quantity of roots eaten	"			1,063	1,070	
Quantity of corn stover eaten	"		631			
Total cost of feed	$	23·00	21·53	22·76	24·23	26·39
Original cost of lambs, at $5.50 per 100 pounds live weight	$	38·22	38·00	38·22	38·17	38·22
Original cost of lambs plus cost of feed	$	61·22	59·53	60·98	62·40	64·61
Selling price, at 6⅛ cents per pound	$	50·35		50·22		
Selling price, at 6⅜ cents per pound	$		50·87			
Selling price, at 7⅛ cents per pound	$				63·41	
Selling price, at 8 cents per pound	$					73·36
Net profit or loss on lot	$	[1]10·87	[1]8·66	[1]10·76	1·01	8·75
Net profit or loss on lamb	$	[1]0·99	[1]0·79	[1]0·98	0·09	0·79
Cost to produce 1 pound gain	$	0·18	0·20	0·18	0·12	11·9

[1]Loss.

CHARLOTTETOWN.

TABLE II.—LAMB FATTENING EXPERIMENT.—Average results of three years' test of clover hay *versus* mixed hay, and corn stover *versus* timothy hay and roots as roughage in fattening lambs.

Lot.		1.	2.	3.
Class of feed for lot.		Clover hay.	Mixed hay, corn stover.	Timothy hay, mangels.
Number of lambs in lot		42	42	42
Number of days in experiment		103	103	103
Total weight at beginning	lb.	3,224¼	3,210¼	3,157
Total weight at end	"	3,694⅓	3,472¼	3,475¼
Gain during period	"	470	262	318
Gain per head	"	11	6	7½
Gain per head per day	"	0·107	0·058	0·063
Quantity of meal eaten by lot	"	3,308	3,132⅓	3,013⅓
Quantity of clover hay eaten by lot	"	8,899	....	....
Quantity of mixed hay eaten by lot	"	....	5,919	....
Quantity of timothy hay eaten by lot	"	....	....	6,228
Quantity of roots and ensilage eaten	"	....	4,889	5,217
Total cost of feed	$	73·07	64·87	65·23
Cost of feed per head	$	1·74	1·54½	1·55
Cost of feed per head per day	$	0·0169	0·015	0·0155
Original cost of lambs	$	163·30	162·67	160·29
Original cost of lambs plus cost of feed	"	236·37	227·54	225·52
Selling price	$	238·10	226·16	215·61
Net profit or loss on lot	$	1·73	[1]1·38	[1]9·91
Net profit or loss per lamb	$	0·04	[1]0·03	[1]0·23
Cost to produce 1 pound gain	cts.	15·5	24·7	20·4

[1]Loss

LAMB FEEDING EXPERIMENTS.—Table of Weights and Gains.

Tag Number.	First Weight.	Last Weight.	Total Gain.
	Lb.	Lb.	Lb.
Pen No. 1—Tag No. 1	66	63	*3
" " 2	55	61	6
" " 3	70	78	8
" " 7	68	78	10
" " 11	62	70	8
" " 17	76½	95	18½
" " 20	69	99	30
" " 22	58	72	14
" " 70	57½	71	13½
" " 73	65	81	16
" " 74	48	54	6
Total	695	822	127
Pen No. 2—Tag No. 24	60½	71	10½
" " 26	63	73	10
" " 27	65½	48	*17½
" " 33	71½	73	1½
" " 36	69	77	8
" " 37	53½	66	12½
" " 38	55½	63	7½
" " 39	67½	88	20½
" " 62	71	100	29
" " 92	53	60	7
" " 96	61	79	18
Total	691	798	107
Pen No. 3—Tag No. 4	55½	79	23½
" " 18	78	99	21
" " 21	51½	60	8½
" " 65	65	75	10
" " 66	57	63	6
" " 67	54	75	21
" " 68	55½	58	2½
" " 71	74	102	28
" " 72	70½	96	25½
" " 75	63	59	*4
" " 76	71	54	*17
Total	695	820	125
Pen No. 4—Tag No. 69	62½	76	13½
" " 77	67½	99	31½
" " 78	68	70	2
" " 79	54½	75	20½
" " 81	80	105	25
" " 83	60	88	28
" " 84	65	98	33
" " 85	53	64	11
" " 87	62½	71	8½
" " 97	58	69	11
" " 86	63	79	16
Total	694	894	200
Pen No. 5—Tag No. 28	76	99	23
" " 34	83	105	22
" " 82	66	83	17
" " 89	54	67	13
" " 90	61	74	13
" " 93	56½	49	*7½
" " 94	57½	81	23½
" " 95	67	100	33
" " 98	63	89	26
" " 99	53½	91	37½
" " 100	57	84	27
Total	694½	922	227½

*Loss

CHARLOTTETOWN.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

SHEEP.

BREEDING FLOCK.

There are now eleven pure-bred Shropshire sheep at this Farm, made up of one 4-shear, one 3-shear, six 2-shear, two shearlings, one shearling ram, and one aged ram "Kelsey's Promise." The latter heads the flock.

A very successful year can be reported from the breeding work. All ewes except the two lambs were bred last fall. All lambs were dropped between the 20th and 30th of March. Nine ewes yielded eleven lambs. Two were rather weaker than the rest and did not survive. Hence there remains a total of nine lusty lambs from eight ewes, which is a very satisfactory increase. There are six ewes and three rams. One young ram from last year's crop was sold during the early winter.

Careful records are being kept of all feeds, etc., in order to demonstrate the profit to be derived from a flock of good sheep, when kept on the farm.

The following is the method of feeding, and foodstuffs consumed during the year: From April 1, 1914, to May 23, 1914, they received 1½ pound hay and one-quarter pound meal per head per day. From May 23 to November 1 (171 days) they were out on pasture. From November 1, 1914, to February 6, 1915, they received 1½ pound hay, 8 pounds roots, and 1½ pound meal per head per day. From February 13 to February 27 they received 1½ pound hay, 4 pounds roots, and 1½ pound meal per head per day. From February 27 to March 31 they received 1½ pound hay and 1½ pound meal per head per day.

The following table gives the total amount of each and cost of feed. The value of foodstuffs was: Hay, \$8 per ton; meal, \$1.59 per hundredweight; and roots and ensilage, \$2 per ton.

No. of Sheep.	Period.	Hay.	Roots and Ensilage.	Meal.	Pasture.	Cost of Feed.
		Lb.	Lb.	Lb.	Days.	$ cts.
10	April 1, 1914, to May 23, 1914	795		132·5		5 28
10	May 23, 1914, to Nov. 1, 1914				1,610	13 10
12	Nov. 1, 1914, to Feb. 6, 1915	1,764	9,408	1,176		35 11
12	Feb. 6, 1915, to Feb. 13, 1915	126	672	126		3 17
12	Feb. 13, 1915, to Feb. 27, 1915	252	672	252		5 69
12	Feb. 27, 1915, to March 31, 1915	576		576		11 46
	Total 12 sheep 365 days	3,513	10,752	2,262·5	1,610	73 81

FINANCIAL STATEMENT.

Breed.	April, 1914.		April, 1915.		Returns including Sales.	Gross returns, made up of increase in value and Sales.
	No.	Value.	No.	Value.		
		$ cts.		$ cts.	$ cts.	$ cts.
Shropshires, all ages	12	278 00	21	415 00	39 70	176 70

Returns.

By increase in value of flock	$ 137 00	
By sales of breeding stock	10 00	
By sales of wool	21 60	
Manure, 8·10 tons at $1 per ton	8 10	
		$ 176 70

Expenditure and Losses.

To food consumed	$ 73 89	
To labour	65 28	
To breeding stock	25 00	
		164 17
Net balance from sheep		$ 12 53

LAMB-FEEDING EXPERIMENT.

As there was practically no clover hay produced at this Farm during the season of 1914, it was thought impracticable to duplicate the previous year's experiment in testing the value of clover *versus* timothy hay for fattening lambs. However, it was considered most prudent to continue the feeding of lambs, in order to get more data regarding the value of various foods. With this object in view a similar feeding experiment was carried on by replacing the clover hay with a combination of timothy and broadleaf.

Fifty nice grade wethers were purchased at Antigonish in November, 1914, costing 6 cents a pound, f.o.b. Antigonish. The freight charge on fifty lambs was $21.25, making the total cost 6·5 cents a pound live weight. That is possibly the highest price lambs have reached during a like period for many years, but there was a great demand for good stock just at that season of the year in 1914.

The wethers were divided into four lots for this test. All lots were fairly even in weight and very uniform. Lot 1 received timothy hay and meal; lot 2, timothy hay, roots, and meal; lot 3 received one feed of timothy and one of broadleaf and meal; and lot 4, one feed of timothy hay and one of broadleaf, roots, and meal.

The meal was fed alike to all lots throughout the test and they received at the start one-half pound per head per day. This was gradually increased until at the end of the period they were receiving 1¾ pound. Each lamb in lots 2 and 4 received 8 pounds of pulped roots per day. This was decreased gradually until the end of the test, at which time they were receiving only 4 pounds. Lots 1 and 3 did not receive any roots. Lots 1 and 2 received 1½ pound of timothy hay per lamb per day. Lots 3 and 4 received timothy hay at the rate of 1 pound, and broadleaf hay at the rate of 1 pound per lamb per day. The meal ration was made up as follows: Bran, 100 pounds; whole oats, 100 pounds; oil cake, 50 pounds; and cotton-seed, 50 pounds.

The cost of the different feeds was figured at: Hay, $8 per ton; meal mixture, $1.59 per hundred weight; and roots, $2 per ton.

NAPPAN.

All lambs were given a preparatory feeding period of two weeks, the better to allow them to become accustomed to their feed and surroundings. The test was started December 14, 1914, and concluded April 1, 1915. Three consecutive weighings were made at the start, and individual weights taken at weekly intervals throughout the test.

Two lambs were lost during the test: One from lot 1 died of pneumonia, and one from lot 4 had a bad case of scours.

The following table gives the results of the test:—

——		Lot 1. Timothy Hay and Meal.	Lot 2. Timothy Hay and Roots and Meal.	Lot 3. Mixture of Timothy and Broad-leaf Hay and Meal.	Lot 4. Mixture of Timothy and Broad-leaf Hay and Roots and Meal.
Number of lambs in lot		11	13	12	12
Number of days in experiment		108	108	108	108
Total weight at beginning of experiment	lb.	1,000	1,180	1,086	1,098
Total weight at finish of experiment	"	1,256	1,588	1,357	1,453
Gain during period	"	256	408	271	355
Gain per head	"	23·3	31·4	22·6	29·6
Gain per head per day	"	·215	·290	·209	·274
Quantity of hay consumed	"	1,782	2,106	2,592	2,592
Quantity of meal consumed	"	1,339·25	1,582·75	1,461·00	1,461
Quantity of roots consumed	"	....	8,528	....	7,872
Total cost of feed	$	28·42	42·12	33·60	41·47
Cost of feed per head	"	2·58	3·24	2·80	3·46
Cost of feed per head per day	cts.	2·39	3·00	2·59	3·20
Cost of 1 pound gain	"	11·10	10·32	12·39	11·68
Original cost of sheep	$	65·00	76·70	70·59	71·37
Original cost of sheep plus cost of feed	"	93·42	118·82	104·19	112·84
Selling price at $8 per hundredweight	"	100·48	127·04	108·56	116·24
Net profit on lot	"	7·06	8·22	4·37	3·40
Net profit on lamb	"	0·64	0·63	0·36	0·29

DEDUCTIONS.

While it has been pointed out in the introduction of this experiment that it is not a duplication of the previous year's experiment, there is, however, sufficient similarity in the two to make some interesting comparisons. When such comparisons are made they coincide very well indeed with those experiments of the two previous years. Hence, considerable assurance may be placed on such results. The following are some of the more striking points to be noted.

First.—That while in 1912-13 and 1913-14, the test showed that clover hay surpassed timothy in economy of production, this test shows that timothy surpasses a combination of timothy and broadleaf.

Second.—That where roots are added to the ration, a greater daily gain is obtained, but not sufficient to compensate for the extra cost of production. This holds true in nearly all tests of previous years.

Third.—That in every test where only meal was fed in addition to the hay the greatest profit was realized.

Fourth.—That, notwithstanding the fact that these lambs cost one-half cent a pound more than those of a previous year, a fair profit was realized over and above the cost of feed.

Fifth.—That when the results of three years' feeding of 141 lambs show a gain of from 70·3 to 99·3 cents per head, or an average of 84·5 cents, there is quite a margin of profit.

Sixth.—That roots play a great part when broadleaf is used in the hay ration.

Seventh.—That there is always a ready demand for winter-fed lambs.

NAPPAN.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

SHEEP.

There are seventeen pure-bred Leicesters at the Cap Rouge Station: one ram lamb, five aged ewes, seven shearlings, and four ewe lambs. The flock is not large, but is composed of good, strong sheep. At present it is kept only to furnish breeders at a reasonable cost, but as soon as the piggery is remodelled and made into a good sheep barn, feeding experiments will be started.

EXPERIMENTAL STATION, LENNOXVILLE, QUE.

REPORT OF THE SUPERINTENDENT, J. A. McCLARY.

SHEEP.

During the winter months there were purchased, locally, fifty-four grade ewes, with the object of experimenting in the eradication of weeds, such as the orange hawkweed—better known in the townships as the paint-brush, ox-eye daisy, etc.—with which the rough pasture land in this section is badly infested.

A grading experiment is to be carried on, to demonstrate the improvement that can be brought about with the common grade ewes by the use of the best registered rams procurable, for a few years; also with the object of seeing if the quality and clipping of wool cannot be improved by better feeding and dipping of sheep for the destruction of ticks. Six of these ewes were shearlings and were not in lamb. The remaining forty-eight produced sixty good lambs, which will be kept through until next winter for feeding purposes.

Five of these sheep were shorn when purchased, which left a clip of forty-nine fleeces, giving an average of 6·71 pounds per sheep. This was graded and sold through the Wool Growers' Association of the county of Sherbrooke. Prices realized were:—

189 pounds "medium" at 31 cents	$ 58 59
125 pounds "low medium" at 30 cents	37 50
15½ pounds "rejected" at 25 cents	3 87
Total	$ 99 96

This is considered a very good price, and shows the advantage of co-operation among the farmers in the selling of their produce.

Two year old Fillies, ran out every day all winter. Experimental Station, Lacombe.

16—1916—39b.

Agassiz, B.C. Clydesdale colts helping prepare the corn land.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

SHEEP.

The flock consists of the following animals: Oxford Down: one ram, three aged ewes, three yearling ewes; grade: forty aged ewes, thirteen yearling ewes.

In 1910-11 a start was made at sheep breeding here, by obtaining a small flock of grade ewes. These ewes were part of a shipment bought in by the Manitoba Sheep Breeders' Association from the range districts of southwestern Saskatchewan. They resembled the usual range type of sheep, though they were better than the average. Under good treatment and feeding these ewes have improved greatly in appearance. They have been bred each year to a pure-bred Oxford Down ram. The offspring shows a decided improvement in size and type over the parent ewes.

The season of 1914 was only moderately successful in raising lambs. Forty-four ewes gave birth to fifty-seven lambs, thirty-eight of which were raised. The deaths were mostly due to goitre; a large percentage of the lambs were afflicted with this trouble at birth. Those that did not die in a few days soon recovered from the trouble.

WINTERING OF BREEDING EWES.

The experiment which was tried last year in regard to feed and shelter for ewes was repeated this year. Alfalfa was compared with mixed hay, composed chiefly of Western Rye grass and timothy, and stabling and feeding in the sheep barn was compared with feeding outdoors with an open shed for shelter. The experiment was not started this year until February 2, and was discontinued on March 20. No grain was fed during most of the period as the sheep were fat to begin with. Neither were they fed any straw or roots. Each lot consisted partly of ewes and partly of last spring's ewe lambs.

SUMMARY of Results.

—		Lot 1. Wintered in Open Shed. Fed Alfalfa.	Lot 2. Wintered in Sheep Barn. Fed Alfalfa.	Lot 3. Wintered in Sheep Barn. Fed Mixed Hay.
Number of ewes in lot		14	15	15
Number of lambs in lot		6	5	5
Weight of ewes, February 2	lb.	2,237	2,236	2,158
Weight of lambs, February 2	"	560	520	510
Weight of ewes, March 29	"	2,315	2,313	2,158
Weight of lambs, March 29	"	595	520	480
Gain or loss per ewe	"	Gain 5·6	Gain 5·1	0
Gain or loss per lamb	"	Gain 5·8	0	Loss 6
Amount of alfalfa used	"	4,400	4,400	
Amount of mixed hay used	"			4,400
Amount of oats and bran used	"	85	85	85

While the sheep fed on alfalfa held their own and made slight gains without grain or roots, those fed on the hay lost weight, on the average. These results are similar to those obtained last year and are corroborated by many others in which alfalfa is compared with other hays.

COST OF FEEDING BREEDING EWES.

As in the case of cattle and swine, records are kept of the feed consumed by the sheep. The table which follows shows the feed used by one ewe during the year, and includes the feed of one lamb from birth to weaning at 5 months of age. This is the average of forty-four ewes rather than the individual record of one. On account of the pasture being very bare from the drought last summer, the sheep had to get grain a good part of the summer.

FEED USED BY ONE GRADE EWE IN ONE YEAR.—(Including Lamb for Five Months).

915 pounds alfalfa hay at $12 per ton	$5 49
234 " oats and bran at $20 per ton	2 34
Total	$7 83

BRANDON.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE ASSISTANT TO THE SUPERINTENDENT, K. MacBEAN, B.S.A.

SHEEP.

The work with sheep at the Experimental Farm, Indian Head, is receiving considerable attention at present, and increased developments are expected in succeeding years.

The breeding flock is composed of one Shropshire ram, one ram lamb of the same breed, six pure-bred Shropshire ewes, seven grade Shropshire ewes, four grade Shropshire shearling ewes, one Shropshire ewe-lamb, and one grade Shropshire ewe lamb.

During the year two Shropshire ram lambs were sold. Our lamb crop was rather light this past season, while three were unfortunately killed by dogs. Eventually, the dogs met with their deserts, and no lambs have since been worried.

A few pure-bred ram lambs are sold for breeding purposes. As yet no pure-bred ewe lambs are being sold, the intention being to keep them to build up the flock.

The common ewes occupy a very important place, as they demonstrate the fact that it is quite possible to build up a good flock of sheep by commencing with common ewes and a pure-bred ram. The ram must be pure-bred, but that it is unnecessary to buy high-priced ewes is proved by results shown at this Farm. By this method of grading up a flock with the use of a pure-bred ram on a grade ewe followed by mating her progeny with a pure-bred ram of the same breed as the original, it takes only a very few years to develop a grade flock of a standing almost equal to that of a pure-bred flock. On this Farm at present there is a Shropshire-grade lamb which would pass for a pure-bred.

For the outlay invested it is questionable if there is any line of farming more profitable than that of raising sheep. The double source of revenue in the sale of wool and mutton has to be taken into consideration, while the use which sheep can make of waste land, weedy summer-fallows, etc., makes them a valuable factor in better farming.

For the purpose of more extended work with sheep in the pasturing of summer-fallows, etc., out of a carload of lambs bought last fall for experimental feeding, one hundred ewe lambs were selected to be retained on the Farm, thus augmenting the permanent flock. These will be bred next season, and in due course experimental work will be carried on in the feeding of lambs bred on the Farm, and the fattening of bought-in lambs discontinued. Last year's results showed a loss in the latter business, while this year's findings prove there is no money in that line of work, in this district at any rate. It may be possible to make a small profit with lambs bought locally, but not if they are shipped in from a distance.

The problems of destruction by dogs and wolves are, however, difficult to solve. Probably, of the two, the wolves present the greater difficulty. This Farm experienced the ravages of both last fall, three lambs having been worried to death by dogs while, worse still, twenty were destroyed by wolves in a single night. The latter were out of the flock already referred to, bought for experimental feeding, and were killed quite close to the buildings.

Out of 360 lambs bought for experimental feeding, 339 were available for the purpose. One died at Lethbridge before shipping, twenty were killed by wolves as already

indicated, and another had to be destroyed on account of an external malformation. Throughout the test, however, one only was lost, and that by having its neck broken.

Of the 339 lambs bought for experimental feeding the following outline indicates their allocation into different groups. The first four groups refer to the ewe lambs to be kept on the Farm as already noted. These were simply carried through the winter, but not fattened.

LAMB-FEEDING EXPERIMENTS.

Group.	Sub-division.	Method of Handling.	No. of Lambs.	Ration.
1	....	In shed, to be open or shut as considered necessary.	24	Oat straw, alfalfa hay and grain (oats and barley in equal proportions).
2	....	"	25	Oat straw, prairie hay and same grain.
3	....	"	25	Oat straw, prairie hay, same grain and turnips.
4	....	"	25	Oat straw, same grain, and turnips.
5	A	Closed shed...............	25	Barley straw, prairie hay and same grain.
	B	"	25	Barley straw, prairie hay and wheat screenings.
6	A	Open shed..................	45	Barley straw, prairie hay and grain (oats and barley in equal proportions).
	B	"	45	Barley straw, prairie hay and wheat screenings.
7	A	Protection of straw stack	50	Same as 6A.
	B	"	50	Same as 6B.

Some of the lambs were shipped from Lethbridge, Alta., others were bought locally, while one lamb used in the experiment was bred on this Farm.

INDIAN HEAD.

LAMB FEEDING EXPERIMENTS—*Continued.*

The following table shows the results of our experiments in fattening lambs shipped from a distance. This line of work would not appear to be a profitable one.

Bought at Lethbridge, Alta.	Group 5. Closed Shed. A	Group 5. Closed Shed. B	Group 6. Open Shed. A	Group 6. Open Shed. B	Group 7. No Shed. A	Group 7. No Shed. B
	Barleystraw prairie hay, and grain (oats and barley in equal proportions).	Barley straw prairie hay, and wheat screenings.	Same as 5A.	Same as 5B.	Same as 5A and 6A.	Same as 5B and 6B.
Number of lambs in experiment.	19	19	22	23	24	25
Number of days in experiment	112	112	112	112	112	112
Total weight at beginning of experiment ... lb.	1,165	1,080	1,275	1,265	1,525	1,530
Total weight at end of experiment ... "	1,445	1,360	1,775	1,755	2,050	2,075
Gain during period ... "	280	280	500	490	525	545
Gain per head ... "	14·9	14·9	22·7	21·3	21·8	21·8
Gain per head per day .. "	·13	·13	·20	·19	·19	·19
Amount of grain eaten by lot ... "	2,484	2,484	3,036	3,174	3,312	3,450
Amount of hay eaten by lot ... "	1,566	1,566	1,914	2,001	2,088	2,175
Amount of straw eaten by lot ... "	1,440	1,440	1,760	1,840	1,920	2,000
Total cost of feed ... $	31·80	31·80	38·83	40·63	42·40	44·15
Cost of feed per head ...	1·67	1·67	1·76	1·76	1·77	1·77
Cost of feed per head per day ... "	·01	·01	·01	·01	·01	·01
Cost of feed per 1 pound gain ... "	·11	·11	·07	·08	·08	·08
Original cost of lambs ... "	92·03	85·32	100·72	99·93	120·47	120·87
Original cost of lambs plus cost of feed ... "	123·83	117·12	139·55	140·56	162·87	165·02
Total receipts from sale .. "	113·43	106·76	139·33	137·76	160·92	162·88
Net loss on lot ... "	10·40	10·36	·22	2·80	1·95	2·14
Net loss per lamb ... "	·55	·54	·01	·12	·08	·08

This next table gives the results of our feeding of lambs bought locally. These are more encouraging than the former

INDIAN HEAD.

LAMB FEEDING EXPERIMENTS—*Continued.*

Bought Locally.	Group 5. Closed Shed. A	Group 5. Closed Shed. B	Group 6. Open Shed. A	Group 6. Open Shed. B	Group 7. No Shed. A	Group 7. No Shed. B
	Barley straw prairie hay, and grain (oats and barley in equal proportions.)	Barleystraw prairie hay, and wheat screenings.	Same as 5A.	Same as 5B	Same as 5A and 6A.	Same as 5B and 6B.
Number of lambs in experiment	6	5	23	22	25	25
Number of days in experiment	112	112	112	112	112	112
Total weight at beginning of experiment ... lb.	435	395	1,445	1,445	1,800	1,780
Total weight at end of experiment ... "	520	465	1,990	1,940	2,220	2,230
Gain during period ... "	85	70	545	495	420	450
Gain per head ... "	14·16	14	23·6	22·5	16·8	18
Gain per head per day ... "	·12	·12	·20	·20	·15	·16
Amount of grain eaten by lot ... "	828	690	3,174	3,036	3,450	3,450
Amount of hay eaten by lot ... "	522	435	2,001	1,914	2,175	2,175
Amount of straw eaten by lot ... "	480	400	1,840	1,760	2,000	2,000
Total cost of feed ... $	10·60	8·83	40·63	38·83	44·15	44·15
Cost of feed per head ... "	1·76	1·77	1·76	1·76	1·77	1·77
Cost of feed per head per day ... "	·01	·01	·01	·01	·01	·01
Cost of feed per 1 pound gain ... "	·12	·12	·07	·07	·10	·09
Original cost of lambs ... "	29·36	24·63	97·53	97·53	121·50	120·15
Original cost of lambs, plus cost of feed ... "	39·96	33·46	138·16	136·36	165·65	164·30
Total receipts from sale ... "	40·82	34·14	155·43	152·29	174·27	175·05
Net profit on lot ... "	·86	·68	17·27	15·93	8·62	10·75
Net profit per lamb ... "	·14	·13	·75	·72	·35	·43

This last table summarizes our results with the fattening of the lamb bred on this Farm. This lamb was a pure-bred Shropshire wether which, though a good lamb, would not have been an ideal ram, and was therefore put into the feeding lot.

LAMB FEEDING EXPERIMENTS —*Concluded.*

Lamb bred on Farm.		Ration. Barley straw, prairie hay, and wheat screenings.
Number of lambs in experiment		1
Number of days in experiment		112
Total weight at beginning of experiment	lb.	85
Total weight at end of experiment	"	110
Gain during period	"	25
Gain per day	"	·22
Amount of grain eaten	"	138
Amount of hay eaten	"	87
Amount of straw eaten	"	80
Total cost of feed	$	1.76
Cost of feed per day	"	·01
Cost of feed per 1 pound gain	"	·07
Original cost of lamb	"	5.10
Original cost of lamb, plus cost of feed	"	6.86
Total receipts from sale	"	8.63
Net profit on lamb	"	1.77

We can only emphasize the conclusion arrived at last year, and this is: There is little or no profit in buying lambs and feeding for market.

It is evident, however, that the feeding of home-bred lambs would be a profitable undertaking. The intention, therefore, of fattening our own lambs in future is one which ought to be followed with good success.

INDIAN HEAD.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

SHEEP-FEEDING EXPERIMENT.

In order to get more conclusive data on the possibilities of fattening range lambs, a continuation of the work of the past three years was followed, with some modifications.

Four hundred and eighty range lambs were purchased last November from Raymond Knight, of Raymond, Alta. A premium was paid for the tops, which brought the price up to $4.12½ per head. The lambs were run on stubble for almost a month, and were then divided equally into two lots of 240 (a good carload in each) and fed alfalfa, and alfalfa and oat sheaves, respectively, for eighty days, when they were sold to the Vancouver & Prince Rupert Meat Company at 8 cents per pound (no shrink) less half per cent for insurance.

As in previous years, the lambs were fed in a wire corral with an open shelter shed on the west end. They were fed twice daily and had free access to water.

The results are based on the same arbitrary feed values as have been used in the past few years, and they are:—

Alfalfa, $12 per ton.
Oat sheaves, $10 per ton.
Whole grain (equal parts of oats and barley), $20 per ton.
Salt at actual cost.

SHEEP-FEEDING experiment, 1914-15.

		Group I.	Group II.
Number of lambs in lot at beginning of period		240	240
Number of days in experiment		80	80
Total weight at beginning of experiment	lb.	1,6077	16,300
Average weight at beginning of experiment	"	66·98	67·91
Total weight at end of period	"	20,130	21,050
Gain for period	"	4,053	4,750
Gain per head for period	"	16·89	19·79
Gain per head per day	"	·021	·024
Quantity of meal fed to lot for period	"	6,885	6,885
Quantity of alfalfa fed to lot for period	"	42,780	30,616
Quantity of oat sheaves fed to lot for period	"	....	13,133
Quantity of salt fed to lot for period	"	188	189
Total cost of feed	$	327·41	320·10
Cost of feed per head for period	"	1·36	1·33
Cost of feed per head per day	cts.	1·7	1·6
Cost to produce 1 pound gain	"	8·07	6·74
Original cost of lambs at $4.12½ per head	$	990.00	990.00
Original cost plus cost of feed	"	1,317.41	1,310.10
Selling price at $7.96 per cwt. (sold at stock yards with 2·16 per cent shrink)	"	1,567.72	1,639.35
Net profit on group	"	250.31	329.25
Net profit per head	"	1.04	1.37

DEDUCTIONS.

As the arbitrary values used in compiling the results just given are quite different from the actual prices prevailing for feeds this past winter, another table is here presented, based on the following values, which closely correspond with the local market conditions for most of the winter:—

Alfalfa (in stack)	$ 8.00	per ton
Oat sheaves (in stack)	10.00	"
Grain (equal parts of oats and barley)	35.00	"

Green oat sheaves are $2 a ton more than alfalfa, because it is less common on the irrigated farms in the district, where alfalfa hay can be produced cheaper. Without doubt it is more profitable to grow alfalfa hay for $8 per ton, on irrigated land, than oat sheaves at $10 per ton. The actual cost of labour in experimental work is considerably higher than what it would be with the average farmer. However, it is generally stated by "sheepmen" that one man with a team can look after one thousand head. On this basis, by allowing $50 per month for the man, it would cost $87.50 to look after five hundred head for 3½ months.

		Group I.	Group II.
Cost of 240 lambs	$	990.00	990.00
Cost of feed	"	293.49	310.50
Cost of labour (estimated)	"	43.75	43.75
Interest on investment at 8 per cent	"	23.10	23.10
Total	"	1,350.34	1,367.35
Selling price	"	1,567.72	1,639.35
Net profit per group	"	217.38	272.00
Net profit per head	"	.90½	1.13

It will be seen from the foregoing tables that group II, receiving the ration of two-thirds alfalfa and one-third oat sheaves, ate more roughage and made more gains, with the result that they returned more profits. The results of the experiment are only further proof of the greater profit in marketing crops "on the hoof" rather than in the ordinary way.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

SHEEP.

The number of sheep owned by this Station at present is nineteen head, composed of eighteen common grade ewes and one pure-bred Shropshire ram. These ewes are typical of the class of sheep being brought in, in large numbers, from the southern part of the province, and from Montana. They are principally Merino and Rambouillet crosses, and are being bred to a Shropshire ram with the object of determining what improvement, if any, can be effected in the quality of the wool and in the weight of lambs at birth and at 6 months of age. These sheep are now heavy in lamb and should begin to drop their lambs about the middle of April.

The cost of carrying such a small flock of sheep through the winter on a farm where a large number of other stock is kept is difficult to determine, for a flock of this size will follow cattle and rustle their living without feed consumed by them being missed. This flock followed the bunch of twenty steers which were fed in the corral, and came through in good condition on the amount of feed they were able to gather from that wasted by the steers. From the figures previously secured it is probably safe to assume that the cost per head for a large flock would not be greater than 2 cents per day. If prairie hay was available at a cost of $3 per ton, which in outlying districts is a fair price, the cost per head would be less.

EXPERIMENTAL FARM, AGASSIZ, B. C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

SHEEP.

No experimental work was done with the sheep this year for two reasons: first, the lack of accommodation; and second, the very poor lambing results in the spring of 1914, due to the ewes being over-fat.

During the year, twenty Dorset Horned ewes and one ram lamb were kept. The ram was purchased in the autumn from Heart's Delight Farm, Chazy, N.Y., and is an excellent specimen of the breed.

The flock has been run to pasture the entire year, and has gathered food, both in summer and winter, that would otherwise have been wasted. This being the case, we consider that the up-keep of the sheep did not cost us anything beyond the value of 50 pounds of salt for the whole year. The sheep were housed in a gravelly knoll in a temporary shed, which cost $8 to erect. All the sheep were in good shape, but they were not allowed to become too fat. At the time of writing, they are in excellent condition, carrying heavy fleeces. About one-third of the ewes have lambed up to the present, and have given 200 per cent of lambs, all of which are living and strong. The lambs are coming later this year, on account of the thirty-day quarantine, which was imposed upon our ram at the time of purchase.

We have had no losses from disease this year, and every eligible ewe proved a breeder. There have been no losses from wild animals, but one lamb was killed by a dog.

Mr. A. McKay, farm foreman, acted as shepherd throughout the year, and the good condition of the flock testifies to his careful attention.

This is an important branch of live stock in British Columbia, and deserves more attention than we have been able to give it in the past.

SWINE.

CENTRAL EXPERIMENTAL FARM OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN, E. S ARCHIBALD, B.A., B.S.A.

There are 220 head of swine of all breeds and ages now on the Central Experimental Farm. These are used for experimental breeding, feeding, and housing, as well as for sales of high-class breeders at a reasonable figure. The breeds kept are Berkshire, Tamworth, and Yorkshire.

The Berkshires are thirty-six in number, including eleven breeding sows, twenty-three young pigs, and two boars.

The Tamworths are forty-six in number, including nine breeding sows, thirty-six young pigs, and one boar.

The Yorkshires are 138 in number, including thirty-seven breeding sows, ninety-eight young pigs, and three boars.

The main piggery, erected in 1910, continues to give excellent satisfaction in all respects, both for experimental feeding work and also in its uses for the farrowing season, feed rooms, and the like. The housing of brood sows, during both winter and summer, in the single-board cabins has also continued to give good results.

The increasing sales and demand from individual farmers and agricultural societies for young breeding pigs may again be reported, and is a healthy indication of the added interest of the farmers, both in the Experimental Farms and in the swine industry.

PIG-FEEDING EXPERIMENTS.

A number of feeding experiments with pigs of all ages were carried on during the summer of 1914 and the winter of 1914-15. Experiments which have been completed to date are herein reported on.

SUMMER FEEDING OF SHOATS IN PADDOCKS.

Experiment No. 1.

The objects of this experiment were as follows:—

(1) To determine the best method of summer feeding of young pigs 12 weeks of age and over, which had been weaned at the commencement of the experiment.

(2) To determine the value of rape as green feed for young pigs.

(3) To determine the value of the hopper grinder self-feeder in the summer feeding of pigs.

As many pigs as could be conveniently accommodated in each paddock were included in each of the lots on this experiment.

Lot 1 was fed a grain mixture composed of equal parts of shorts, ground oats, and ground corn, fed as a skim-milk slop.

Lot 2 received the same grain mixture, as a skim-milk slop, plus all the green rape which they would clean up. This amounted to a small fraction less than 5 pounds per head per day during the experiment.

Lot 3 received the shorts and ground oats as lots 1 and 2, namely, as a skim-milk slop. The corn for lot 3 was placed whole in the hopper grinder. The amount of corn placed in the grinder per week was exactly one-third of the total grain ration which this lot received, hence the total composition of the grain received was the same as in lots 1 and 2.

Samples of feed were taken for chemical analyses, for which readers are referred to the report of the Dominion Chemist.

The animals were weighed once every fortnight, individual weights being kept. The feed was also weighed throughout the experiment.

VALUATION OF FOODSTUFFS.

The following valuations were placed on the meals and forages consumed:—

Meal mixture	Per ton.	$ 28 00
Green rape	"	3 00
Skim-milk	"	4 00

Experiment No. 1.

Lot.		1	1A	Average 1 and 1A	2		3	
Feed given.		Shorts, Oats, Corn, and Skim-milk.	Same as Lot 1.	Same as Lot 1.	Shorts, Oats, Corn, and Skim-milk.	Green Rape.	Shorts, Oats, and Skim-milk.	Corn.
How fed.		Slop.			Slop.		Slop.	Grinder.
Number of animals in each group		7	9	8	7		8	
First weight gross, August 24, 1914	lb.	671	519	595	771		829	
First weight average, August 24, 1914	"	95·8	57·6	76·7	110·1		103·6	
Finished weight gross, November 2, 1914	"	1,252	1,237	1,244·5	1,259		1,466	
Finished weight average, November 2, 1914	"	178·8	137·4	158·1	179·8		183·2	
Number of days in experiment		70	70	70	70		70	
Total gain per period		581	718	649·5	488		637	
Average gain per animal	"	83	79·77	81·38	69·7		79·62	
Average daily gain for group	"	8·3	10·25	9·27	6·97		9·1	
Average daily gain per animal	"	1·18	1·13	1·15	·995		1·13	
Quantity of meal eaten by group for period	"	2,273·88	2,280	2,276·9	1,678		2,445	
Quantity of roughage (green rape) eaten by group for period	"				2,354			
Quantity of milk eaten by group for period	"	1,678	2,047	1,862·5	1,707·7		1,837	
Total cost of feed	$	35.18	36.01	35.59	30.43		37 90	
Cost of feed per head	"	5·02	4·00	4·51	4·34		4·73	
Cost of feed per head per day	cts.	7·1	5·7	6·4	6·2		6·7	
Cost to produce 1 pound gain	"	6·0	5·0	5·5	6·2		5·9	

DATA FROM EXPERIMENT.

In this experiment the following features are worthy of note:—

(1) The greatest gains in the experiment were made in lots 1 and 1A, where the grains were all fed in the skim-milk slop.

(2) The lowest cost of feed per head was in lot 2, on green feed. This was not the cheapest feeding, as this lot cost more per pound gain than any other lot.

(3) All the pigs above included in all the lots remained in good health throughout the experiment; hence the influence of rape as a laxative, and the influence of the hopper grinder to supply exercise were not demonstrated.

One pig in lot 1 died when forty-eight days on experiment. One pig in lot 2 died when thirty-eight days on experiment. Both these individuals were unthrifty from the start and made practically no gains while on the experiment. The loss of these individuals was not due to the foodstuffs in any way.

(4) Green feed as rape, fed at the rate of about 5 pounds per head per day, did not, in this experiment, prove economical in replacing the grain mixture under the above conditions. Comparing the average of lots 1 and 1A with lot 2 it will be noticed that 39 pounds of meal mixture gave the same returns as 3,138 pounds of rape and 414 pounds of milk. Hence the feeding of rape was not only a loss, but in this experiment showed a loss of 28 cents on the value of the milk.

(5) Green feed as rape does not contain nearly the same value as green feed in the shape of fresh cut clover. (For comparative purposes see annual report for 1912.)

(6) The hopper grinder may be used economically to grind a part of the grain ration. Previous tests in 1913 show that 4-month pigs cannot make economical gains, if any, when compelled to get all their ration from the hopper grinder.

(7) In the above experiment an average of lots 1 and 1A showed 7 per cent cheaper gains than lot 3, working on the hopper grinder. This, however, does not credit the grinder for the cost of grinding the corn, approximately $2 per ton, or the slightly less labour in feeding lot 3.

On the other hand, the labour of grinding required the pigs to consume about 10 per cent more meal and milk, with slightly less gain per head, hence the 7 per cent cheaper gains in lots 1 and 1A.

Experiment No. 2.

GRAINS FOR WEANING PIGS FED OUTSIDE.

The problem which is confronting farmers who intend to go fairly heavily into hog production is the raising of young pigs to the age of 3 or 4 months on a limited quantity of dairy by-products or even without the help of skim-milk, buttermilk, or whey. This difficulty is more particularly noticed in winter and autumn, although it applies also to summer feeding. To gain information as to the best meals and meal mixture for the purpose of substituting dairy by-products, two experiments were conducted in the year 1904 during the months of January, February, and March. Readers are referred to the report for the year 1904 regarding this matter.

During the summer and fall of 1914 another experiment along somewhat different lines but relating to the same subject was conducted at the Central Experimental Farm. The objects of this experiment were: (1) To determine a good grain ration for young pigs as soon as they start eating until the age of 3 or 4 months; (2) to compare oil meal and Swift's Digester Tankage in such rations; (3) to determine the value of skim-milk as compared with Swift's Digester Tankage used in other rations as a supplement; (4) to compare single meals *versus* a meal mixture of two and three meals with and without skim-milk in the feeding of young pigs previous to and directly after weaning.

This experiment was conducted in the outside feeding pens, where the pigs had the shelter of the single-board hog cabins.

PLAN OF EXPERIMENT.

A litter of pigs was chosen for each lot in this experiment before weaning.

Lot 1 (Yorkshires) were fed a ration composed of skim-milk and a grain mixture made up of three parts of finely ground corn, three parts of shorts, and one part of linseed oil cake meal. All the pigs in this lot remained healthy during the experiment.

Lot 2 (Tamworths) were fed a ration composed of skim-milk and a grain mixture made up of finely ground corn, three parts; shorts, three parts; and Swift's Digester Tankage, one part. One pig in this lot died suddenly on October 16, 1914. Although this animal was not of as rugged a type as the other pigs in lot 2, yet he was a fairly good individual. An examination revealed inflammation of the lining of the stomach, and slight bloating. Apparently the trouble was due to individual weakness rather than to the foodstuffs, as all the other animals remained healthy during the experiment.

Lot 3 (Berkshires) were fed a ration composed of skim-milk and a meal mixture made up of finely ground corn, six parts, and Swift's Digester Tankage, one part. All the pigs remained very healthy throughout the experiment.

Lot 4 (Tamworths and Yorkshires) were fed on a ration composed of finely ground corn, six parts; and Swift's Digester Tankage, one part, with no skim-milk. All the pigs remained healthy throughout the experiment.

Lot 5 (Berkshires) were fed on a ration composed of skim-milk and finely ground corn. All the pigs remained healthy throughout the experiment.

All the pigs were weaned at 63 days of age, and were fed the above grains previous to and just after weaning.

Samples of feed were taken for chemical analyses, for reference to which readers are referred to the report of the Dominion Chemist.

The animals were weighed once every fortnight, individual weights being kept. The feed was also weighed throughout the experiment.

VALUATION OF FOODSTUFFS.

The following valuations were placed on the meals and other foodstuffs consumed:—

Corn	Per ton.	$ 28 00
Shorts	"	28 00
Skim-milk	"	4 00
Swift's Digester Tankage	"	50 00

EXPERIMENT NO. 2.

Lot.		1	2	3	4	5
Feed.		Corn, 3 parts Shorts, 3 parts Oil meal, 1 part Skim-milk.	Corn, 3 parts Shorts, 3 parts Tankage, 1 part Skim-milk.	Corn, 6 parts Tankage, 1 part Skim-milk.	Corn, 6 parts Tankage, 1 part Skim-milk.	Corn, Skim-milk.
Number of animals in each group		6	4	7	6	6
First weight gross, August 26, 1914	Lb.	84	95	166	84	78
First weight average, August 26, 1914	"	14	23·7	23·7	14	13
Finished weight gross, November 18, 1914	"	538	400	730	306	468
Finished weight, average, November 18, 1914	"	89·66	100	104·2	51	78
Number of days in experiment		84	84	84	84	84
Total gain per period	Lb.	454	305	564	222	390
Average gain per animal	"	75·66	76·25	80·57	37·	65
Average daily gain for group	"	5·44	3·6	6·7	2·6	4·6
Average daily gain per animal	"	·9	·9	·95	·43	·76
Quantity of meal eaten by group for period	"	616·3	532·3	890	518·4	653
Quantity of tankage eaten by group for period	"	......	88·9	149	86·53	....
Quantity of milk eaten by group for period	"	1,698·2	1,780·8	2,034		1,647
Quantity of oil meal eaten by group for period	"	102·7				
Total cost of feed	$	13 90	13 23	20 24	9 41	12 43
Cost of feed per head	"	2 31	3 31	2 89	1 56	2 07
Cost of feed per head per day	Cts.	2·7	3·9	3·4	1·8	2·4
Cost to produce 1 pound gain	"	3·06	4·3	3·5	4·23	3·1

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DATA FROM EXPERIMENT.

This experiment has not been duplicated as yet, but the following data from the first trial are worthy of note. It is proposed to repeat this experiment in 1915-16.

1. The greatest total gains per pig placed the lots in the following order: Lots 3, 2, 1, 5, 4.

2. The cheapest gains per pig placed the lots in the following order: Lots 1, 5, 3, 4, 2.

3. Comparing lots 1 and 2, it is seen that linseed oil meal and Swift's Digester Tankage produced almost identically the same total gains in rations of that kind, containing a good variety and nutritive balance. The greater cost of tankage thus makes the feed for lot 2 much more expensive and the profits proportionately less.

4. Comparing lots 2 and 3, it is seen that three parts of corn replacing the three parts of shorts produced greater gains. This was due to the greater quantities of both grain and milk consumed by lot 3, and whether due to the individual capacity of the animals or to the palatability of the foodstuffs, only succeeding experiments will show. However, 478 pounds of shorts, plus 9 pounds of tankage, plus 1,170 pounds of skim milk gave the same returns as 412 pounds of corn. Valuing shorts at $28, tankage at $50, and skim-milk at $4 per ton, finely ground corn thus had a valuation of $44.80 per ton.

5. Comparing lots 3 and 4, it is seen that greater and cheaper gains followed the addition of skim-milk to the corn and tankage ration. It is shown that 405 pounds of corn plus 69 pounds of tankage give the same gains as 2,034 pounds of skim-milk; or, at the above valuation of corn and tankage, milk in this ration acquires a value of $7.30 per ton, or 37 cents per hundredweight.

6. Comparing lots 3 and 5, it is seen that tankage added to a corn and skim-milk ration induces greater though slightly more expensive gains. The greater gains from the addition of tankage is probably due to the greater variety, thus causing the pigs to consume greater quantities of both the mixed meal and skim-milk. It is seen that 24 pounds of corn plus 271 pounds of skim-milk give the same gains as 149 pounds of tankage; or, at the above valuations for corn and skim-milk, tankage in this ration has only a valuation of $11.80 per ton.

7. Comparing lots 4 and 5, it is seen that tankage alone is not an entirely satisfactory substitute for skim-milk in the corn feeding of young pigs. The tankage-fed pigs made much smaller gains, and nearly 40 per cent more expensive gains. It is seen that 227 pounds of corn plus 146 pounds of tankage are required to take the place of 1,647 pounds of skim-milk. When corn has a valuation of $28 per ton, and skim-milk $4 per ton, tankage thus has a value of only $3.01 per ton.

8. Although tankage did not replace skim-milk either as to total or economical gains, yet the above experiment shows that where gains can be made at only 4·23 cents per pound Digester Tankage can be successfully used in limited quantities as at least a partial substitute of skim-milk, when it can be purchased at $50 per ton or less and where dairy by-products are not available.

9. In general appearance, lots 1, 2, and 3 were the best. Lot 5 made very good gains and very cheaply, but all animals showed lack of growth of bone as found in the first three lots. Lot 4 was even more deficient in growth, all animals being a little stunted and lacking the capacity for larger quantities of feed and the growth to finish prime hogs at an early age.

Experiment No. 3.

ELEVATOR SCREENINGS FOR FATTENING SWINE.

This experiment was conducted on the suggestion of the Seed Branch, Department of Agriculture. The materials were supplied by the Seed Branch in order to obtain

data regarding this matter. Readers are referred for further information regarding the materials to the report of the Seed Commissioner, Mr. G. H. Clark.

The needs of some experimental evidence to show the value of the elevator screenings from our many large elevators in Canada is illustrated by the fact that over 35,000 tons of screenings were shipped to the United States from Fort William alone in the year ending August 31, 1913. It is a fact that a large part of these screenings should never have reached the elevators, but should have been retained on the farms to supply cheap, useful foodstuffs for the farm animals.

ANALYSIS OF ELEVATOR SCREENINGS.

The following botanical analyses were supplied by the Seed Commissioner:—

A composite sample from 6,000 tons of elevator screenings gave the following separations: 37 per cent scalpings, 7 per cent succotash flax, 18 per cent buckwheat screenings, 38 per cent blackseeds.

Scalpings.—65 per cent wheat; 25 per cent other grains; 3 per cent weed seeds; 7 per cent straw and chaff. Considered excellent feed—no immediate need to investigate its value.

Succotash Flax.—30 per cent flax; 40 per cent broken wheat; 15 per cent weed seeds, chiefly wild buckwheat, lamb's quarters, and wild oats; 15 per cent chaff.

Buckwheat Screenings.—58 per cent wild buckwheat; 29 per cent broken wheat; oats, and flax; 9 per cent weed seeds; 4 per cent chaff.

Black Seeds.—Before analysing this material a separation was made of it by means of the 1/25-inch perforated zinc sieve.

The 38 per cent black seeds was thus separated into 7 per cent which passed through the 1/25-inch sieve and 31 per cent above it.

Of the portion passing through the 1/25-inch sieve, 22 per cent was tumbling mustard, 63 per cent dust, 10 per cent lamb's quarters, and 5 per cent other weed seeds.

Of the portion passing over the 1/25-inch screen, 53 per cent was lamb's quarters, 3 per cent wild mustard, 8 per cent other mustard, 9 per cent other weed seeds, and 27 per cent chaff.

OBJECTS OF EXPERIMENT.

(1) To determine the value of a well-balanced ration in the winter feeding of young pigs for market.

(2) To compare this well-balanced ration with the elevator by-product black seeds.

(3) To determine the value of black seeds fed in conjunction with roots and skim-milk as compared with black seeds fed in water only.

(4) To determine the value of buckwheat screenings in swine feeding.

(5) To compare with the well-balanced ration, buckwheat screenings, black seeds with and without milk and roots, and the value of complete elevator screenings in conjunction with feed flour (Ogilvie's "Noxol.")

PLAN OF EXPERIMENT.

All the lots were fed in the main piggery, housed to best advantage for winter feeding. Lots of four each were fed in duplicate. The following tables represent the totals and averages for each lot and its duplicate.

The first five lots of pigs received water, roots, and skim-milk in the same quantities per pig. Lot 6, however, received no roots or skim-milk, but only the black seeds and water. The object of this was to determine whether or not the black seeds had a poisonous effect upon young pigs, and whether they would supply sufficient food to maintain life.

Lot 1 (Yorkshires and Berkshires) received a grain ration composed of shorts, three parts; finely ground corn, three parts; and oil meal, one part. This is the standard meal mixture for this experiment, and is termed "meal" throughout.

Lot 2 (Yorkshires and Berkshires) were fed a mixture of meal, one part, and finely ground black seeds, one part.

Lot 3 (Yorkshires, Berkshires, and Tamworths) were fed finely ground black seeds.

Lot 4 (Yorkshires and Berkshires) were fed finely ground buckwheat screenings.

Lot 5 (Berkshires and Tamworths) were fed complete elevator screenings, three parts, and Ogilvie's "Noxol" flour, one part.

Lot 6 (Yorkshires) were fed finely ground black seeds and water without milk and roots.

Samples of all grains and the various screenings were taken for chemical analyses. Readers are referred to the report of the Dominion Chemist.

Individual weights of pigs were taken every two weeks throughout the experiment. The feed also was weighed regularly.

VALUATION OF FOODSTUFFS.

The following valuations were placed on the meals and the other feeds consumed:—

Meal mixture (corn, shorts, and oil cake)	Per ton.	$ 28 00
Buckwheat screenings	"	14 00
Complete elevator screenings	"	10 00
Finely ground black seeds	"	4 00
Ogilvie's "Noxol" flour	"	28 00
Roots	"	2 00
Skim-milk	"	4 00

The above valuations for elevator products were taken as a fair standard for comparison.

EXPERIMENTAL Period.

Lot.		1	2	3	4	5	6
Feed.		Meal, Milk.	Meal, Blackseeds, Milk.	Blackseeds, Milk.	Buckwheat Screenings, Milk.	Complete Screenings, Flour, Milk.	Blackseeds and Water.
Number of animals in each group.		8	8	8	8	8	4
First weight gross	Lb.	861	980	835	842	594	638
First weight average	"	107	122	104	105	74	159·5
Finished weight gross	"	1,205	1,237	881	1,145	754	640
Finished weight average	"	151	154	110	143	94	160
Number of days in experiment		42	42	42	42	42	42
Total gain for period	Lb.	344	257	46	303	160	2
Average gain per animal	"	44	32	6	38	20	·5
Average daily gain for group	"	8·40	6·08	1·12	7·2	3·84	·04
Average daily gain per animal	"	1·05	·76	·14	·90	·48	·01
Quantity of meal eaten by group for period	"	866	864	432	775	481	360
Quantity of roots eaten by group for period	"	324	324	290	324	324	......
Quantity of skim-milk eaten by group for period	"	1,354	1,354	1,209	1,354	1,354	
Total cost of feed	$	15.13	9.89	3.52	8.43	6.49	.72
Cost of feed per head	"	1.89	1.24	.44	1.05	.81	.18
Cost of feed per head per day	Cts.	4·5	3·1	1	2·5	1·9	·42
Cost to produce 1 pound gain	"	4·7	3·8	7·6	2·7	4·0	36·

DATA FROM EXPERIMENTAL PERIOD.

The following deductions might fairly be taken from this experimental period:—

(1) The order of the various lots in relation to greatest gains is as follows: 1, 4, 2, 5, 3, 6.

(2) The order of the cheapest gains per lot is as follows: 4, 2, 5, 1, 6, 3.

(3) Comparing lot 1 (a well-balanced, palatable ration) with lot 2 (where half the meal was replaced by black seeds), it is seen that nearly one-third less gains were made but the gains were about one-quarter cheaper due to the low cost of the black seeds. It is seen that 287 pounds of meal gave the same gains as 573 pounds of black seeds plus 108 pounds of roots plus 451 pounds of skim-milk. Hence, at the above valuations of meal, milk, and roots, black seeds in this ration would have a value of $10.50 per ton.

(4) Comparing lots 1 and 3, it is found that lot 3 gave extremely small gains (smaller than should have been made on roots and milk alone, and at a higher cost per pound gain). It is seen that 860 pounds of meal gave the same gains as 3,316 pounds of black seeds, 1,909 pounds of roots, and 7,955 pounds of milk. At the above valuations of meal, roots, and milk, black seeds in this ration are quite useless, the 1½ ton of black seeds not only having no feeding value but actually causing a loss of $4.98 on the value of the roots and milk of lot 3.

(5) Comparing lots 2 and 3, it is seen that when the meal is completely replaced by the black seeds, only one-sixth of the gains are made, and these gains at just double the cost per pound. In other words, 460 pounds of meal would give the same gains as 1,916 pounds of black seeds plus 1,217 pounds of roots plus 5,295 pounds of milk. In

other words, at the above valuations of skim-milk, roots, and meal, the black seeds are of no value, and even cause a loss on the value of the milk and roots of lot 3, amounting to $5.42.

(6) Comparing lots 1 and 6, it is seen that lot 6 on water and black seeds alone made practically no gains, but merely maintained weight for forty-two days. It would thus appear that in lot 2 the milk, roots, and meal plus 70 pounds of black seeds, the former three elements of the ration, are responsible for fairly large and cheap gains.

(7) Comparing lots 3 and 6, it is seen that the milk and roots of lot 3 are altogether responsible for the gains. With milk and roots at the above valuations, black seeds fed thus have only a valuation of 65 cents per ton.

To summarize the value of black seeds in this experiment, it is safe to say that the food value of this by-product is low even when fed in small quantities in a well-balanced ration containing good variety; that it has little food value when fed alone or in conjunction with only one or two other foodstuffs; that animals of 160 pounds weight can be made to eat 2 pounds each per day and thus maintain weight for a short period of about 1½ month; that this product is rather unpalatable and, if constituting any considerable proportion of the grain ration, is unpleasant to the animals.

(8) Comparing lots 1 and 4, it is seen that lot 4 on buckwheat screenings produced the second largest gains, made the cheapest gains at the lowest cost, and proved buckwheat screenings to be worth about the same as the meal mixture. It is seen that 866 pounds of meal gave the same gains as 852 pounds of buckwheat screenings plus 32 pounds of roots plus 135 pounds of skim-milk. At the above valuations of meal, roots, and skim-milk, buckwheat screenings thus have a valuation of $27.60.

(9) Comparing lots 1 and 5, it is seen that much smaller gains were made where the complete elevator screenings and feed flour constituted the total grain ration. Nevertheless, the low valuation of the screenings shows that cheaper gains can be made, for a short period, than with the meal mixture. It is seen that 866 pounds of meal gave the same gains as 740 pounds of screenings, 250 pounds of feed flour, 325 pounds of roots, and 1,350 pounds of skim-milk. At the above valuations for meal, roots, and skim-milk, a mixture of elevator screenings, three parts, and feed flour, one part, is worth $18.40 per ton.

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FINISHING PERIOD.

Owing to the limited quantities of elevator screenings and by-products, the experimental period was only conducted for forty-two days. At the end of this time all six lots were placed on a finishing period preparatory to marketing. All the lots were given the standard meal mixture, similar to that given to lot 1 of the experimental period. All the lots were given roots and skim-milk except lot 6.

FINISHING PERIOD.

Feed given.		Meal—all same mixture.					
Lot.		1	2	3	4	5	6
Number of animals in each group.		7	8	8	8	8	4
First weight gross	Lb.	1,084	1,237	881	1,145	754	640
First weight average	"	155	154	110	143	94	160
Finished weight gross	"	1,254	1,530	1,176	1,428	972	852
Finished weight average	"	179	191	147	178	121	213
Number of days in experiment		42	42	42	42	42	42
Total gain for period	Lb.	170	293	295	283	218	212
Average gain per animal	"	24	37	37	35	27	53
Average daily gain for group	"	2·49	7·04	7·04	6·64	5·12	5·04
Average daily gain per animal	"	·57	·88	·88	·83	·64	1·26
Quantity of meal eaten by group for period	"	712	1,001	798	938	537	712
Quantity of roots eaten by group for period	"	245	310	310	310	310	....
Quantity of milk eaten by group for period	"	1,177	1,290	1,290	1,290	1,290	....
Total cost of feed	$	12.55	16.90	14.05	16.02	10.34	9.96
Cost of feed per head	"	1·79	2.11	1.76	2.00	1.29	2.49
Cost of feed per head per day	Cts.	4·3	5·0	4·2	4·7	3·0	5·92
Cost to produce 1 pound gain	"	7·3	5·7	4·7	5·6	4·7	4·69

DATA FROM FINISHING PERIOD.

The increased age of the various lots in the finishing period would naturally be conducive toward less gains per day, and at a greater cost. This is demonstrated in lot 1, which in both the experimental and the finishing period received the same ration.

Lot 1 in the experimental period showed an average gain of 1·05 pound per pig per day, and only ·57 pound per pig per day in the finishing period. This lot stood highest in the experimental period for greatest daily gains, but stood lowest in the finishing period for daily gains. It would appear natural that the other five lots, which received much poorer rations in the experimental period, would respond more readily to a finishing period than would lot 1. One Yorkshire barrow died suddenly at the commencement of the fourth week of the finishing period. This animal had not shown any gains from the commencement of this period. Evidently the trouble was with the individual, as all the other animals in this lot made fairly satisfactory gains throughout the finishing period.

Lot 2 made greater gains, but at somewhat greater cost per pound gain, on the good feed of the finishing period.

Lot 3 made over six times the daily gain, and at only three-fifths the cost, on the superior feed of the finishing period.

Lot 4 made less gains, and at a much greater cost, on the finishing period. The actual palatability and balance of the ration of lot 4 on the experimental period was apparently about as good as lot 1 on the same period or lot 4 on the finishing period, hence the similarity to lot 1 in the results of the change of feed.

Lot 5 made one-half greater gains, and at only slightly greater cost, on the superior feed of the finishing period.

Lot 6 showed the most marked change of any. The most rapid gains of the whole experiment were made by lot 6 when changed from the ration of black seeds and water in the experimental period to the standard meal mixture and water in the finishing period. The cost of gains was also materially lowered in the finishing period. Attention is drawn to the fact that, because of this rapid change when the animals are placed on good feed after a stunting period, it is not a good practice, as the animals lost forty-two days of gains before they started to increase in weight and produce profitably.

SOW-FEEDING EXPERIMENT.

As will be noted by referring to the annual report of the Central Experimental Farm for the year ending March 31, 1914, considerable work was carried on during that year along the lines of feeding tankage to in-pig sows to test its influence on the condition of the sow during pregnancy, the condition of the litters at birth, and the effect on the milk production of the sow during the first eight weeks after parturition. Owing to the fact that in the spring of 1914 some of the sows were late in farrowing, only a limited number could be reported on, thus detracting from the value of the experiment, and making necessary a repetition of the same.

This work was continued during the winter and spring of 1914-15, with a considerably larger number of sows than was used in the previous experiment, making the results that much more authoritative. In addition to, and combined with, the test of tankage, a test was made of a hopper grinder self-feeder, by means of which the sows were made to grind a part of their grain ration for themselves, incidentally securing some exercise while doing so. All the sows were housed in single-board hog-cabins situated in paddocks outside. This necessitated the exposing of the grinders to a certain extent, and as a consequence considerable difficulty was experienced in keeping them in running order; for, even when covered over, snow drifted in and

caused the mechanism to freeze up. Unless used in a close-covered shed they would hardly be practical for winter feeding of brood sows. On occasions when the grinders were out of order the sows were fed the corn whole in their troughs.

PLAN OF EXPERIMENT.

Six pens, five containing eight sows and one containing nine sows, were set aside for this work. These sows were graded to make all the lots as uniform as possible with regard to age, weight, general type, and breeding qualities. The experiment was carried on with three lots, each lot being duplicated, and the average of the two taken in calculating results. As some of the sows have not finished the eight-weeks period after farrowing at time of writing, all could not be reported on.

Lots 1 and 1A were fed the regular meal mixture, namely, equal parts by weight of bran, shorts, and finely cracked corn, fed as a thick slop.

Lots 2 and 2A were fed the regular meal mixture as lots 1 and 1A, with the exception that one-fifth by weight of this mixture was replaced by Swift's Digester Tankage. This ration was fed in the same way as that of the preceding lots.

Lots 3 and 3A were fed whole corn placed in the hopper grinder. In addition, they received, fed in the same manner as the preceding lots, the same number of pounds of shorts and of bran as they consumed of corn from the hopper grinder.

In addition to the above grain ration, all the sows received approximately the same amounts of water, roots, clover or alfalfa hay, and skim-milk, when available.

From November 27 to February 28 they received 3 pounds of meal mixture and 8 pounds of roots per sow per day. From March 1 to March 31 they received 5 pounds of meal and 2 pounds of roots per sow per day. From April 1 to end of experiment they received 6 pounds of meal per sow per day.

Samples of all meals were taken for chemical analysis, for the results of which the reader is referred to the report of the Dominion Chemist, Dr. F. T. Shutt.

VALUATION OF FOODSTUFFS.

The following valuations were placed on the meals and roughages consumed:—

Meal mixture (bran, shorts, and corn)	Per ton.	$ 23 00
Tankage (Swift's Digester)	"	50 00
Roots	"	2 00

Tables I, II, and III following, give the results of the experiment, while table IV gives a summary of the results of the two years' work.

TABLE I.—Lot 1, Brood Sow Feeding Experiment, Winter, 1914-15.

Breed.	Ear tag.	Date of service.	Date of farrowing.	Weight November 27, 1914.	Weight before farrowing.	Weight of sows 4 weeks after farrowing.	Weight of sows 8 weeks after farrowing.	Number of pigs in litter.	Weight of litter.	Number in litter 4 weeks after farrowing.	Weight of litter 4 weeks after farrowing.	Number in litter 8 weeks after farrowing.	Weight of litter 8 weeks after farrowing.	Amount of meal consumed up to farrowing-time.	Amount of roots consumed up to farrowing-time.	Meal consumed 8 weeks after farrowing.	Roots consumed 8 weeks after farrowing.	Total cost of ration.	Days in experiment.	Ration.
				lb.	lb.	lb.	lb.		lb.	No.	lb.	No.	lb.	lb.	lb.	lb.	lb.	$ cts.	dys.	Meal mixture
Yorkshire	222A	Oct. 17, '14	Feb. 7, '15	432	423	357	344	13, All good	33	10	122·5	9	246	216	576	230	230	5·93	128	Bran, shorts and corn, equal parts by weight, fed as a slop.
Yorkshire	158T	Nov. 9, '14	Mar. 4, '15	413	494	395	375	9, All good	27	6	99·5	6	156·5	299	752	309	54	7·80	153	
Yorkshire	248	Nov. 30, '14	Mar. 26, '15	475	595	500	470	14 (8 good, 6 small)	31·5	7	97·0	7	147·0	409	796	331	10	9·32	175	
Berkshire	304	Oct. 2, '14	Jan. 23, '15	328	395	308	282	10 (9 good, 1 weak)	25·5	7	76·0	7	132·5	171	456	208	328	5·14	113	
Yorkshire	309	Oct. 10, '14	Feb. 3, '15	385	423	353	319	11 (10 good, 1 dead)	26·0	9	131·0	9	236·0	204	544	230	262	5·80	124	
Yorkshire	322A	Oct. 29, '14	Feb. 19, '15	350	409	328	293	11 (10 fair, 1 small)	24·0	8	99·5	8	156·0	252	672	278	80	6·85	140	
Yorkshire	247A	Dec. 4, '14	Mar. 27, '15	360	462	370	342	13 (9 good, 4 small)	32·0	9	118·0	9	189·0	414	798	332	8	9·38	176	
Total				2743	3201	2611	2425	81	199	56	743·5	55	1263	1965	4594	1918	972	50·22	1009	
Average 7 head				392	457	373	346	11·6	28·4	8	106·2	7·9	180·4	281	656	274	139	7·17	144	

TABLE II.—Lot 2, Brood Sow Feeding Experiment, Winter, 1914-15.

Breed.	Ear tag.	Date of service.	Date of farrowing.	Weight November 27, 1914	Weight before farrowing.	Weight of sows 4 weeks after farrowing.	Weight of sows 8 weeks after farrowing.	Number of pigs in litter.	Weight of litter.	Number in litter 4 weeks after farrowing.	Weight of litter 4 weeks after farrowing.	Number in litter 8 weeks after farrowing.	Weight of litter 8 weeks after farrowing.	Amount of meal consumed up to farrowing-time.	Amount of roots consumed up to farrowing-time.	Meal consumed 8 weeks after farrowing.	Roots consumed 8 weeks after farrowing.	Total cost of ration.	Days in experiment.	Ration.
				lb.	lb.	lb.	lb.		lb.	Mo.	lb.	No.	lb.	lb.	lb.	lb.	lb.	$ cts.	dys	Meal mixture
Yorkshire	219	Dec. 4, '14	April 1, '15	455	519	515	475	7, All good	22·5	6	104·0	6	180	440	806	336	....	11·82	181	
Tamworth	199	Nov. 23, '14	Mar. 17, '15	488	567	514	495	11 { 7 good, 2 weak, 2 dead	26·5	7	84·0	5	116	364	778	322	28	10·54	166	
Yorkshire	221A	Sept. 17, '14	Jan. 9, '15	515	543	479	438	16 { 13 good, 3 small	42·0	8	111·5	8	238	129	344	180	412	5·14	99	
Yorkshire	202A	Oct. 16, '14	Feb. 7, '15	557	610	529	474	11 { 9 good, 1 small, 1 dead	25·0	7	93·0	7	205	216	576	242	230	7·31	128	Same meal mixture as lot 1, with one-fifth by weight replaced by tankage
Yorkshire	15	Oct. 14, '14	Feb. 5, '15	555	580	597	568	10 { 8 good, 2 small	19·5	4	63·5	4	142	210	560	236	246	7·14	126	
Yorkshire	223A	Oct. 7, '14	Jan. 28, '15	500	558	488	490	11, All good	26·0	5	67·0	4	122	186	504	218	298	6·54	118	
Tamworth	392	Nov. 4, '14	Feb. 24, '15	300	409	333	319	9, All good	24	9	155·0	9	249	267	712	293	94	8·75	145	
Tamworth	304	Oct. 20, '14	Feb. 9, '15	317	400	310	275	9 { 8 good, 1 small	27	8	135·0	8	237	222	592	248	214	7·38	130	
Tamworth	393	Nov. 23, '14	Mar. 17, '15	450	595	520	480	12 { 10 good, 2 small	28·5	11	144·0	9	213	364	778	322	28	10·55	166	
Total			....	4137	4781	4285	4014	96	241·0	65	957·0	60	1702	2398	5650	2397	1550	75·17	1259	
Average, 9 head			....	459	531	476	446	10·6	26·8	7·2	106·3	6·6	189	266	628	266	172	8·35	140	

TABLE III.—Lot 3, Brood Sow Feeding Experiment, Winter, 1914-15.

Breed.	Ear tag.	Date of service.	Date of farrowing.	Weight, November 27, 1914.	Weight before farrowing.	Weight of sows 4 weeks after farrowing.	Weight of sows 8 weeks after farrowing.	Number of pigs in litter.	Weight of litter.	Number in litter 4 weeks after farrowing.	Weight of litter 4 weeks after farrowing.	Number in litter 8 weeks after farrowing.	Weight of litter 8 weeks after farrowing.	Amount of meal consumed up to farrowing time.	Amount of roots consumed up to farrowing-time.	Meal consumed 8 weeks after farrowing.	Roots consumed 8 weeks after farrowing.	Total cost of ration.	Days in experiment.	Ration.
				lb.	lb.	lb.	lb.		lb.	No.	lb.	No.	lb.	lb.	lb.	lb.	lb.	$ cts.	dys	Meal mixture
Yorkshire..........	301	Dec. 15, '14	April 9, '15	410	540	410	370	14 {11 good... 3 small...	40	10	127·5	6	182	488	806	336	....	10·28	189	Corn, shorts and bran, equal parts by weight. Shorts and bran fed as a slop. Corn fed whole in grinder.
Yorkshire	321A	Nov. 20, '14	Mar. 13, '15	345	437	378	375	12 {11 good.... 1 weak....	30·5	8	96·0	7	137	344	770	318	36	8·42	162	
Yorkshire..........	215A	Oct. 10, '14	Feb. 1, '15	530	600	480	415	12 {11 good.... 1 dead....	33·0	5	101·5	5	178	198	528	226	274	5·68	122	
Yorkshire.	234A	Oct. 7, '14	Jan. 30, '15	424	493	372	350	12 {9 good.... 3 dead....	34·5	8	130·5	8	244·5	192	512	222	286	5·55	120	
Yorkshire..........	330A	Oct. 8, '14	Jan. 28, '15	445	493	391	375	14 {9 good.... 5 weak....	27·5	3	47	3	99·0	186	496	218	298	5·44	118	
Berkshire..........	207	Dec. 21, '14	April 14, '15	365	492	362	332	10, All good...	24·5	10	133	10	225·0	518	806	336	....	10·63	194	
Berkshire..........	107	Dec. 5, '14	Mar. 31, '15	320	355	305	250	10 {9 good.... 1 small....	28·0	9	120	9	204·0	434	806	336	....	9·66	180	
Berkshire..........	339	Nov. 30, '14	Mar. 26, '15	262	322	300	270	9 {6 good.... 2 small.... 1 dead....	20·0	6	82	6	143·0	409	796	331	10	9·31	175	
Total..........		....	....	3101	3732	2998	2737	93	238·0	59	837·5	54	1412·5	2769	5520	2323	904	64·97	1260	
Average, 8 head.....		....	....	387	466	375	342	11·6	29·7	7·4	104·7	6·7	176·5	346	690	290	113	8·12	1575	

TABLE IV.—Summary of Results, Brood Sow Feeding Experiment—Winters, 1913-4, and 1914-15.

Lot.	Ration.	Average amount of meal consumed per sow.	Average cost of feed per animal per day.	Number of days in experiment.	Average gain in weight per sow from Nov. 27 to just before farrowing.	Average loss in weight per sow in first 4 weeks after farrowing.	Average loss in weight second 4 weeks after farrowing.	Average Weight of Pigs in Litter. At birth.	At 4 weeks.	At 8 weeks.	Condition of Litter at Birth. Good.	Small weak or dead.
		lb.	cts.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	p.c.	p.c.
1914-15, Lot 1	Corn, shorts and bran, equal parts	555	4·95	144	65	84	27	2·45	13·27	22·96	83·9	16·0
1914-15, Lot 2.	Above mixture plus one-fifth tankage	532	5·96	140	72	55	30	2·51	14·72	28·36	85·4	14·5
1914-15, Lot 3	Corn, shorts and bran. Corn in grinders	636	5·15	157·5	79	91	23	2·55	14·19	26·15	81·7	18·2
1913-14, Pen 1	Bran, shorts	980	6·18	176	72	92·4	31·2	2·44	11·4	19·66	85·1	14·8
1913-14, Pen 2	Above mixture plus one-third tankage	883	8·63	163	60	84·2	41·6	2·42	13·5	25·2	91·8	8·1

DATA FROM EXPERIMENTS.

The results of this experiment, coupled with those of the experiment carried on in the winter of 1913-14, permit of more definite conclusions being drawn than heretofore. At the same time it must be pointed out that these results do not show any decided advantage in favour of one ration over another. However, some interesting facts may be pointed out and summarized as follows:—

1. The amount and cost of food per sow per day does not vary to any extent within the five lots, except where tankage enters into the ration, in which case the cost is higher, the increase being proportionate to the amount of tankage used.

2. The gain in weight of the sows before farrowing and loss during the eight weeks immediately after farrowing are fairly constant, with the smallest loss after farrowing in favour of the tankage ration in the 1914-15 experiment.

3. The condition of the young pigs at birth, as indicated in the last two columns of table IV, is rather significant, for here again the advantage is in favour of the tankage ration in both instances.

4. The average weight of pigs at birth is practically equal in all lots, while the weights at 4 weeks and 8 weeks of age show a slight increase in gain in each case in favour of the tankage ration.

5. A comparison of lot 1, the check lot, with lot 3, where the grinder was used, to grind the corn for the sows, shows a slight advantage in weight in the litters at all stages of growth, but the difference is hardly sufficient to warrant putting much stress on it. If the cost of grinding the corn were deducted from the cost of feed the balance would be slightly more in favour of lot 3, but this would be offset again by the trouble experienced in operating the machines, consequently the hopper grinder may be considered as of no value in the out-door winter feeding of brood sows.

FINANCIAL STATEMENT FOR SWINE.

Below are submitted inventories and returns for swine on the Central Experimental Farm for the year April 1, 1914, to March 31, 1915.

	April 1, 1914.		March 31, 1915.		Returns, including Sales.	Gross Returns, including Sales and increased Values.
	No.	Value.	No.	Value.		
		$ cts.		$ cts.	$ cts.	$ cts.
Swine, all breeds and ages	217	4,563 00	220	4,854 00	1,870 78	2,963 28

Returns.

By Increased value	$ 291 00	
Sales of breeding stock	892 50	
Sales of feeding stock	1,549 78	
Boar service fees	30 00	
Manure, 200 tons at $1	200 00	
Gross returns		$ 2,963 28

Expenditures.

To Foods consumed	$ 1,664 65	
Purchase of breeders	292 00	
Labour expended	950 00	
Gross expenditures		$ 2,906 65
Net balance from swine		$ 56 63

OTTAWA.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

BREEDING SWINE.

There are at present eighteen pure-bred breeding pigs at this Farm. Two breeds only are kept, namely, Berkshire and Yorkshire.

Of Berkshires there are three aged sows, three young sows, one aged boar, one 8-months-old boar, and four young boars.

Of Yorkshires there are five aged sows and one aged boar.

All breeding pigs are in excellent condition and are giving very satisfactory returns. Four sows have farrowed to date, three Yorkshires and one Berkshire, yielding thirty-two young pigs, or an average of eight per litter.

During the greater part of the winter, all young breeding sows and boars were housed outside in hog cabins. (See accompanying photo.) They came through the winter in excellent shape; in fact, they did very much better than those kept inside, which goes to show that plenty of fresh air and exercise is most beneficial to young growing pigs.

The following is the method of feeding and the foodstuffs consumed by pigs of different ages:—

From April 1 to July 1, 1914, the ten aged pigs received 4 pounds shorts and 6 pounds skim-milk per head per day.

From July 1 to November 1, 1914, they received 4 pounds shorts, 4 pounds skim-milk, and 5 pounds green feed per head per day.

From November 1, 1914, to February 13, 1915, they received 4½ pounds shorts, half pound cracked corn, 2 pounds skim-milk, and 2½ pounds pulped roots per head per day.

From February 13, 1915, to March 31, 1915, they received 4½ pounds shorts, half pound cracked corn, 4 pounds skim-milk, and 2½ pounds pulped roots per head per day.

The eight young pigs received, from December 1, 1914, to January 9, 1915, 2 pounds shorts, 3 pounds skim-milk, and 2½ pounds pulped roots.

From January 9, 1915, to March 31, 1915, they received 2 pounds shorts, half pound cracked corn, 3 pounds skim-milk, and 2½ pounds pulped roots.

From February 20 to March 31, 1915, they received half pound molasses.

The following table gives the total amount of each and the cost of feed. The value of foodstuffs was: Shorts, $30 per ton; cracked corn, $38 per ton; green feed, $2 per ton; skim-milk, 20 cents per hundredweight; and molasses, 20 cents per gallon.

Aged pigs.	Period.	Shorts.	Cracked corn.	Skim-milk.	Roots	Green feed.	Molasses.	Cost of feed.	
No.								$ cts.	$ cts.
10	April 1, 1914, to July 1, 1914	3,640	....	546	.....	......	......	55 69	......
10	July 1, 1914, to Nov. 1, 1914	4,920	....	4,920	.....	6,150	......	89 79	......
10	Nov. 1, 1914, to Feb. 13, 1915	4,745	545	2,100	2,630	......	......	88 36	......
10	Feb. 13, 1915, to March 31, 1915	2,070	230	1,840	2,630	......	......	41 73	275 57
Young breeding pigs.									
8	Dec. 1, 1914, to Jan. 9, 1915	640	....	960	960	......	......	12 48	.....
8	Jan. 9, 1915, to March 31, 1915	1,296	324	1,944	1,624	......	......	31 10	......
8	Feb. 20, 1915, to March 31, 1915	....	....	......	......	......	324	4 80	48 38
18	365 days	17,311	1,099	12,310	7,844	6,150	324	......	323 95
Feeding pigs.									
4	212 days	1,776	324	636	378	......	......	......	34·45
									358·40

FINANCIAL STATEMENT FOR SWINE.

Breeds.	April 1, 1914.		April 1, 1915.		Returns, including sales.	Gross returns, made up of increased value and sales.
	No.	Value.	No.	Value.		
		$		$	$	$
Yorkshires and Berkshires (all ages)	11	300 00	54	618 00	271 00	589 00

Returns.

Increase in value	$ 318 00	
Sales during the year	243 00	
Value of manure	15 00	
Services	13 00	
		$ 589 00

Expenditures.

Cost of feed and bedding	$ 398 40	
Cost of labour	164 25	
Cost of new stock	25 00	
		$ 587 65
Net balance		$ 1 35

NOTE.—There were four pigs which could not be classed as breeders, as they went off their feed and it took them some time to get back again. Hence they only brought half as much for pork as they otherwise might have. Then, too, the cost of feeding the matured sows is higher than it should be, due to the lack of pasturing facilities during the summer months. Again, the prices of feed were very high throughout the heaviest feeding period.

NAPPAN.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

SWINE.

The Yorkshire herd at this Station numbers sixteen head, made up of two breeding sows and one good boar, three yearling sows and a litter of pigs farrowed last winter.

There being no suitable accommodation for facilitating experimental work in the feeding and care of swine, temporary quarters were made in an old barn, pending the construction of the proposed piggery. The basis of feed was second-cut clover hay, wheat bran, and shorts. In the summer and autumn the swede turnips and pasture, together with a very small amount of grain, kept these animals in splendid shape.

The feed was given out-of-doors all winter, in order to force the sows to get the exercise so necessary to all these animals, and particularly to breeding sows. Sods taken in during the fall were also given them regularly, in the yard.

The following head of Yorkshires have been sold for breeding purposes during the year:—

One registered boar.	$ 18 00
One registered sow.	20 00

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

SWINE.

There is only one Yorkshire sow on the Farm, and she will soon be sent to the Ste. Anne Station, as the piggery is to be transformed into a sheep barn. No hogs will be kept until proper accommodation is available.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

SWINE.

There are thirty-six swine on this Farm on March 31, 1915. They consist of the following: Berkshire: five brood sows, one boar, and ten young pigs; Yorkshire: six brood sows, one boar, and thirteen young pigs.

The best of the surplus pure-bred offspring are sold for breeding purposes to farmers. Most of them are sold at weaning, and at that age they are usually valued at $8. This permits a farmer to obtain a start in pure-bred swine at low cost. As they get older, higher prices are charged. As only one boar of each breed is kept, it is often necessary to cross-breed in order to avoid in-breeding. The cross-bred offspring are used for pork production and for experimental feeding. Some of the less desirable pure-breds are used in the same way.

COST OF FEEDING A BROOD SOW.

Records have been kept of the feed given to various animals, in order to get data on the cost of production. The amount of feed consumed by one sow from April 1, 1914, to March 31, 1915, is presented herewith. The sows were not pastured at all last year, and the grain fed is all charged at average rates for grain of good quality. The cost of keeping a sow could be lowered somewhat by the use of pasture and screenings or other low-grade grain.

Feed used by Brandon Claribelle, Yorkshire Sow, April 1, 1914, to March 31, 1915.

943 pounds of oat chop at $20 per ton	$ 9 43
363 pounds of shorts at $22 per ton	3 99
215 pounds of feed flour at $30 per ton	3 22
78 pounds of bran at $20 per ton	78
Total	$ 17 42

This sow raised a litter of eight pigs, and the food which they ate up to weaning time, at 7 weeks of age, is included in the mother's feed.

PIG-FEEDING EXPERIMENT.

Barley is generally accepted as the standard food for pig fattening, but differences of opinion exist as to what other feeds are best to use with barley. Oats are used to quite an extent for this purpose, but, especially in a year like this, when oats are very dear, the profit to be obtained would seem to be very uncertain. In order to test whether or not mill feeds such as flour and shorts would give more economical results, this experiment was tried:—

Four different rations were used, which were fed to four lots of five pigs each. Lot 1 received barley chop; lot 2, barley chop and feed flour in the proportion of three parts of barley chop to one part of feed flour; lot 3, barley chop and shorts, three to one; and lot 4, barley chop and oat chop, one to one. These feeds were put into the trough dry and luke-warm water poured onto them. The hogs were fed twice a day, and were

started on 3 pounds per pig per day. This amount was gradually increased until by February 17, they were receiving 7 pounds per day, which rate was continued until the end of the experiment.

The pigs used in the experiment were a uniform lot, such as may be found on the average farm in the fall. They were Yorkshire and Berkshire grades and crosses. The twenty pigs were divided into four as equal lots as possible. They were purchased from a farmer at Minto, and arrived at Brandon on November 10. They were all fed on the same rations from November 10 to November 25, which was the day the experiment started. The feed used prior to starting them on the experiment was composed of three parts of oat chop, one part of feed flour, and one part of shorts. This feed is also charged up to the pigs, and appears in the following table. From November 28 to February 20, each pig received 1 pound of Digester tankage per day. They also received a limited amount of charcoal at different intervals. They were housed in dry, warm pens, and were perfectly healthy throughout the entire experiment. The pigs were sold to one of the local butchers for 6½ cents per pound.

The following tables show: first, the gains made by each pig during each month of the experiment, and secondly, a summary of the whole experiment, showing comparative results in gains, profits, cost of production, etc., of the four lots.

MONTHLY GAINS IN WEIGHT.

Lot 1.—Fed Barley Chop.

Pig.	Weight. Nov. 17.	Weight. Dec. 24.	Weight. Jan. 21.	Weight. Feb. 18.	Weight. Mar. 4.	Gain in 3½ months.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
No. 020	97	138	185	235	265	68
No. 804	85	127	171	215	243	158
No. 905	80	110	149	190	224	144
No. 97	70	81	120	150	175	105
No. 002	68	105	159	203	226	158
Total	400	561	775	993	1,133	733
Average per pig	80	112·2	155	198·6	226·6	146·6

Lot 2.—Fed Barley Chop and Feed Flour.

Pig.	Weight. Nov. 17.	Weight. Dec. 24.	Weight. Jan. 21.	Weight. Feb. 18.	Weight. Mar. 4.	Gain in 3½ months.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
No. 807	100	155	200	245	280	180
No. 010	76	106	149	210	228	152
No. 82	82	125	162	210	248	166
No. 018	75	131	158	215	240	165
No. 112	66	95	127	185	200	134
Total	399	612	796	1,065	1,196	797
Average per pig	79·8	122·4	159·2	213	239·2	159·4

LOT 3.—Fed Barley Chop and Shorts.

Pig.	Weight. Nov. 17.	Weight. Dec. 24.	Weight. Jan. 21.	Weight. Feb. 18.	Weight. Mar. 4.	Gain in 3½ months.
	Lb.	Lb.	Lb	Lb.	Lb.	Lb.
No. 116	95	135	177	230	260	165
No. 021	87	117	159	200	235	148
No. 024	80	113	155	195	210	130
No. 016	70	105	137	185	202	132
No. 006	65	83	130	165	195	130
Total	397	553	758	975	1,102	705
Average per pig	79·4	110·6	151·6	195	220·4	141

LOT 4.—Fed Barley Chop and Oat Chop.

Pig.	Weight. Nov. 17.	Weight. Dec. 24.	Weight. Jan. 21.	Weight. Feb. 18.	Weight. Mar. 4.	Gain in 3½ months.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
No. 012	91	128	171	213	240	149
No. 005	89	125	163	205	230	141
No 023	83	117	155	193	215	132
No. 025	70	104	145	185	200	130
No. 806	65	83	130	165	175	110
Total	398	557	764	961	1,060	662
Average per pig	79·6	111·4	152·8	192·2	212	132·

BRANDON.

SUMMARY OF RESULTS.

Feed.	Lot 1. Fed Barley Chop.	Lot 2. Fed Barley chop and Feed Flour, 3 to 1.	Lot 3. Fed Barley chop and Shorts 3 to 1.	Lot 4. Fed Barley chop and Oat Chop. 1 to 1.
Number of pigs in lot	5	5	5	5
First weight, gross, November 17, 1914 lb.	400	399	397	398
First weight, average	80	79·8	79·4	79·6
Finished weight, gross, March 4, 1915 "	1,135	1,196	1,102	1,060.
Finished weight, average "	227·0	239·2	220·4	212
Total gain in 107 days "	735	797	705	662
Average gain per pig "	147·0	159·4	141	132·4
Average daily gain per pig "	1·37	1·48	1·32	1·24
First cost of pigs (including freight) at $4.13 each $	20·65	20·65	20·65	20·65
Total cost of feed $	35·24¾	36·76¾	34·33¾	37·27
Total cost $	55·89¾	57·41¾	54·98¾	57·92
Receipts from sale at 6½ cts. per pound $	73·64½	77·74	71·63	68·90
Profit $	17·74¾	20·32¼	16·64¼	10·98
Average cost per pig $	4·13	4·13	4·13	4·13
Average cost of feed per pig $	7·05	7·35	6·87	7·45
Average selling price per pig $	14·73	15·55	14·33	13·78
Average profit per pig $	3·55	4·07	3·33	2·20
Average cost of 100 pounds gain $	4·79	4·61	4·87	5·63
Amounts of feed used:—				
Oats at 50 cents. per bushel lb.	135	135	135	1,352
Barley at 60 cents. per bushel "	2,433	1,825	1,825	1,216
Shorts at $22 per ton "	45	45	653	45
Feed flour at $30 per ton "	45	653	45	45
Tankage at $40 per ton "	84	84	84	84

The following points may be drawn from this experiment:—

(1) Barley chop is a good feed for fattening hogs, as all the hogs in the experiment made good gains.

(2) Oat chop and barley chop gave the poorest gains and the costliest gains. Oat chop is not as good a feed for fattening hogs as the other combinations under test, and at present prices, costs too much.

(3) The addition of feed flour to the barley chop, even though it made a more expensive feed, increased the gains in weight and made the cost of production lower.

(4) Shorts did not give as good results as feed flour for mixing with barley; in fact, the barley alone in this test did slightly better than barley and shorts.

(5) Even with hogs at 6½ cents per pound, and grain at the high prices charged in this experiment, good wages and some profit besides were made in feeding these hogs.

BRANDON.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE ASSISTANT TO THE SUPERINTENDENT, K. MacBEAN, B.S.A.

SWINE.

In the herd of swine at present on the Indian Head Experimental Farm, there are two boars and four sows of the Yorkshire breed, with one boar and four sows representing the Berkshire breed.

During the year, only two Yorkshire boars and one Berkshire boar were sold to farmers for breeding purposes. There was a greater demand for boars than the Farm could supply, but there was no demand for sows.

Due to lack of accommodation, it was necessary to sell a number of the young sows to the butcher, only eight of the best being kept for breeding purposes.

All the sows have been wintered in outside cabins, and results prove that such is a very desirable method of wintering brood sows.

There is room for much important work with swine at this Farm, and, when the equipment is available, hopes are entertained for considerable development in this branch of the animal husbandry work.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

SWINE.

The hogs owned by this Station on March 31, number thirty-nine, composed of the following: 1 Yorkshire boar, 7 Yorkshire sows, 2 Berkshire boars, 6 Berkshire sows, 10 young Berkshire pigs, 13 barrows and sows.

A number of feeding experiments have been carried on during the year, and the reports on these trials are submitted herewith. The Station is as yet without a regular pig pen, but the use of hog cabins has been so satisfactory that the lack of a pig pen was not felt very seriously, though such a building would facilitate experimental feeding to some extent.

The Yorkshire boar at the head of the herd is developing into an animal of splendid size, with ample bone, remarkable back and depth of side. He weighs 800 pounds in fair breeding condition, and is leaving pigs of splendid vigour, that develop rapidly.

PIG-FEEDING EXPERIMENTS.

RATION FOR PIGS AFTER WEANING.

Three groups of pigs were fed three distinct rations with the object of determining the best feed for young pigs just after being weaned. The following table gives the results.

Three groups of hogs were fed as follows:—

Group 1.—Six hogs, 10 weeks old; fed barley and skim-milk.

Group 2.—Five hogs, 9 weeks old; fed shorts and water.

Group 3.—Five hogs, 9 weeks old; fed shorts and skim-milk.

—		Group 1. Barley and skim-milk.	Group 2. Shorts and water.	Group 3. Shorts and skim-milk.
Weight at commencement	lb.	370·	269	198·
Average weight at commencement	"	61·6	53·8	39·6
Weight at finish	"	445	350	318
Average weight at finish	"	74·1	70·	63·6
Total gain	"	75·0	81·	120·
Average gain	"	12·5	16·2	24·
Average daily gain	"	·52	·67	1·
Cost of grain at 1 cent per pound	$	3·92	3·86	3·30
Cost of skim-milk	$	·52		·45
Cost per 100 pounds gain	$	5·92	4·76	3·12

VALUE OF FROSTED WHEAT.

Two groups of hogs were fed as follows:—

Group 1.—Consisting of seven hogs; were fed well ground, slightly frosted wheat and water.

Group 2.—Consisting of ten hogs; were fed oats, barley well ground, and skim-milk, in proportion of one part of oats to two parts of barley and enough skim-milk to make a rather thick slop.

—		Group 1. Frosted wheat and water.	Group 2. Oats, barley and skim-milk.
Weight at commencement	lb.	580·	730·
Average weight at commencement	"	83·	73·
Total weight at finish	"	810·	970·
Average weight at finish	"	116·	97·
Total gain	"	230·	240·
Average gain	"	32·85	24·
Average daily gain	"	1·37	1·
Cost of grain at 1 cent per pound	$	7·50	10·60
Cost of skim-milk	$	....	5·03
Cost per pound gain	$	3·26	6·51

In a second trial to determine the value of frosted wheat, the average cost of 1 pound of gain was 5·14 cents, while the average cost for a period of sixty-seven days was 4·2 cents per pound. When pork is worth 6 cents per pound, gains in live weight of hogs made on the above basis would give to frosted wheat a value of $1.33 per hundred pounds. Still another trial gave results as follows:—

Two groups of hogs, consisting of five each, were fed as follows:—

Group 1.—Well-ground frozen wheat and water.

Group 2.—Well ground oats and barley and water, grain in proportion of one part of oats to two parts of barley.

—		Group 1. Frozen Wheat.	Group 2. Oats and Barley.
Weight at commencement	lb	666	680
Average weight at commencement	"	133·2	136·
Total weight at finish	"	1,060·	1,030·
Average weight at finish	"	212·	206·
Total gain	"	394·	350·
Average gain	"	78·8	70·
Average daily gain	"	1·83	1·62
Cost of grain at 1 cent per pound	$	16·25	16·90
Cost per 100 pounds gain	$	4·12	4·82

COST OF KEEPING SIX SOWS FOR ONE YEAR.

One Berkshire and five Yorkshire sows have been carried for the full year. The cost of feed for the period has been as follows:—

Five months on pasture at 50 cents per sow per month	$ 15 00
Seven months on grain, total consumed 5,600 pounds at 1 cent per pound	56 00
1,200 pounds of skim-milk per sow, at 20 cents per hundred pounds	14 40
	$ 85 40
Average cost per sow	$ 14 23

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COST OF PRODUCING PORK.

The following figures have been secured while finishing five groups of pigs for market, and represent the cost of carrying these pigs from the time they were weaned until they were sold:—

No. of pigs.	Average age when sold.	Average weight when sold.	Average price when sold per cwt.	Average cost per pound to produce.	Average profit per pound.
	Days.	Lb.	$ cts.	cts.	cts.
36	190	189·83	6 42	3·54	2·88

Allowing that one litter per year represents the work to be expected of each sow, and deducting the cost of maintaining the sows producing the above litters for the year during which the pigs were farrowed, from the profit on the production of the pork, a net profit of $111.45, or a profit per sow of $22.28, is shown.

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EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

BREEDING WORK WITH HOGS.

The breeding herd of Yorkshire swine has been increased considerably in the course of the year. There are now two stock boars, twenty-five sows of breeding age, and six younger sows, making a total of thirty-three head in the breeding herd. Besides this increase, quite a number of sales have been made of breeding stock, for which the demand was good, particularly in the earlier part of the year.

In the breeding work, particular attention has been paid to selection for quality, size, and uniformity. Continuing the practice of last year, all breeding stock has been kept in cots and allowed as much range as possible. This method of housing has proved very economical and, in a climate such as obtains here, we consider it the most satisfactory method of housing breeding stock.

Late in the autumn of 1914, all the breeding stock was moved to a bush field on the north side of the farm, where they were allowed to run during winter. There was a quantity of fern in the bush, and from digging this the pigs secured their own green food. This, coupled with a judicious amount of grain, gave us sows in good condition in the spring, which produced strong healthy litters.

A short trial was made on feeding clover silage to brood sows, and although we have not yet sufficient figures to publish, the results appeared very good. When the sows were all in good condition, and pregnant, they were given as much clover silage as they would eat, together with one-third of their usual grain ration, and were allowed free access to water. The sows appeared to enjoy this ration, and continued to put on flesh till farrowing time.

The following summary gives the performance of the fifteen sows which had litters during the year. These sows ranged in age from 1 year to 7 years.

SUMMARY of Breeding Work—Summer and Winter Litters.

Year, 1914-15.	Number of sows.	Number of litters.	Number of pigs farrowed.	Average number farrowed per litter.	Number of pigs raised.	Average number raised per litter.	Per cent raised.
Summer litters	....	9	82	9·11	72	8·00	87·80
Winter litters..	....	12	127	10·58	100	8·33	78·84
Total.....	15	21	209	9·95	172	8·2	82·3

Performances of the Individual Sows.

Number of Sow.	Age.	Summer Litter.		Winter Litter.	
	Years.	Number farrowed.	Number raised.	Number farrowed.	Number raised.
2	7			15	7
3	5			13	9
6	1·5	7	6		
7	1·5	6	6		
8	1·3	7	6	7	7
9	1·6	10	8	11	9
10	3	12	10	10	3
11	3	7	7	8	8
12	2·35	8	7		
13	2·35	14	12	13	13
17	2	11	10	8	8
19	2	Premature birth.		12	11
23	1·2			10	9
31	1			10	8
32	1			10	8
Totals		82	72	127	100

This we consider a very ordinary performance. There was probably more loss in the winter litters, caused by moving the sows to a very rough shed in the bush, and having them farrow in a strange place. In spite of this the number of pigs raised in proportion to the number farrowed is 6·2 per cent higher this year than last.

Below are given our records of the cost of keep for one year of an aged boar, and the cost of raising one young boar from 7 to 13 months of age.

Aged Boar: Cost for One Year.

Ration—	
Green food (mangels, etc.)—1,918 pounds at ·15 cent	$2 87
Shorts—1,384 pounds at 1¾ cent	17 99
Chop—205 pounds at 1·0 cent	2 05
Oil meal—59 pounds at 1·75 cent	1 03
Total cost	$23 94

Young Boar: Cost from 7 to 13 Months During Winter.

Ration—	
Green food (mangels, etc.)—684 pounds at ·15 cent	$ 1 02
Shorts—810 pounds at 1·3 cent	10 53
Chop—181 pounds at 1·0 cent	1 81
Oil meal—33 pounds at 1·75 cent	58
Skim milk—605 pounds at ·25 cent	1 51
Total cost	$15 45

In the case of the aged boar, the ration supplied did not make him fat but kept him in excellent breeding condition; but with respect to the young boar, he put on flesh and made splendid growth, showing plenty of bone of good quality. Both pigs were kept in cots and allowed to run in yards, from which they could obtain only a very limited amount of green food.

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We also give some figures collected on the cost of keeping brood sows and raising young pigs. The figures given were obtained from the records of sows ranging from 1 to 7 years of age; in the case of the litters produced, they were obtained from the fall and winter feeding of the sows.

Average of Five Sows; 1 to 7 years old, autumn and winter keep From time of weaning to farrowing spring litter, 13½ days.

Ration—	
Wheat shorts—580 pounds at 1·3 cent	$7 53
Chop—29 pounds at 1·0 cent	29
Oil meal—43 pounds at 1·75 cent	75
Total	$8 57

From time of farrowing to weaning—60 days (including food for young pigs).

Ration—	
Wheat shorts—615 pounds at 1·3 cent	$7 99
Oil meal—3·5 pounds at 1·75 cent	6
Skim-milk—530 pounds at ·25 cent	1 32
Mangels—355 pounds at ·15 cent	53
Total	$9 90
Total cost of food for sow and litter	$18 47
Average number of pigs farrowed	11·2
" weight of pigs farrowed ... lb.	2·37
" number of pigs raised	8·02
" cost per pig raised	$2 32

Cost of raising the young sows from weaning to 6 months of age—120 days. (Average of five young pigs.)

Ration—	
Shorts and chop (mixed)—480 pounds at 1·15 cent	$5 52
Skim-milk—[illegible] pounds at ·25 cent	60
Green food (pasture approximate, $1)	1 00
Total	$7 12

Cost of raising the young sows from 6 months to 1 year of age. (Average of five young pigs.)

Ration—	
Shorts and chop (mixed), 586 pounds at 1.15 cent	$6 74
Skim-milk—380 pounds at ·25 cent	95
Green food—740 pounds at ·15 cent	1 11
Oil meal—39·5 pounds at 1·75 cent	69
Total	$9 49
Cost of raising young brood sows to 1-year old	$18 93

EXPERIMENTAL WORK WITH SWINE.

In our annual report for 1913-14, we published the results of some fairly extensive feeding trials with hogs. In these trials rice meal was tested against other foods, and was found to be unprofitable when fed in any quantity.

It was not only unprofitable but also injurious, producing a diseased condition, the symptoms of which, as was stated, resembled those of beri-beri in the human subject. We are aware that this last point is one for the pathologist rather than the agricul-

turist; yet we mention this resemblance because it seems to throw light on our problem. In other words, it has given us a suggestion for the year's work, which we hope will be justified by its results.

It must be remembered that in last year's work, rice meal formed the whole or half the grain ration, but was always fed in combination with roots, skim-milk, dried blood, or such foods. This year rice meal was fed as a complete ration in some cases, but always with the complementary green foods, etc. When fed in mixtures the rice meal constituted one-third of the grain ration, as opposed to one-half in last year's experiment. In spite of the decreased proportion of the meal, the disease occurred in every case where no corrective was used, though the symptoms naturally took longer to appear.

With the various theories as to the cause of beri-beri, we have nothing to do. It will be sufficient to mention that some authors consider that the disease is caused by the lack of some digestive ferment in polished rice; others by a poison in the rice; and others again by the lack of some necessary ingredient, notably phosphorus, in the rice diet. This last theory seems to fit our case.

Reference must be made here to the experiments of Hart, McCollum, and Fuller[1]; which have a direct bearing upon our work. These investigators fed pigs certain forms of inorganic phosphorus, in an attempt to prove that inorganic phosphorus could be assimilated by animals, to supplement a ration extremely low in phosphorus content. As controls, they used a normal ration for fattening hogs. The results are definite. They found that animals fed a low phosphorus ration, supplemented by different forms of inorganic phosphorus, made as vigorous a development as others fed a normal ration. On the other hand, those receiving the same ration, without the addition of inorganic phosphorus, made no gains after a certain point, and eventually showed a diseased condition.

The symptoms described very strongly resemble those observed in pigs fed upon rice meal. We quote from the Wisconsin publication:

> "By January 17 one of the animals showed stiffness of the hind-legs and a partial loss of their control. A few days later the other animals of the same lot manifested similar symptoms . . . . . . By the end of January, it became necessary to assist the animals to their feeding troughs. They continued to lie in a dormant, stupefied condition a large share of the time. When standing, the hind limbs assumed an oblique position, the hind feet resting far beneath the body, and near the forefeet."

Elsewhere reference is made to the weakness of the limbs, twitching tendency of the muscles, dragging the hind-quarters, and the peculiar attitude when standing. These symptoms were reproduced exactly in the case of our rice meal fed pigs. In every case the animals showed symptoms more or less acute, in proportion to the length of the period and the amount of meal consumed: Lameness, particularly of the hind-legs, and the peculiar "humped up" attitude when standing, which is very typical; gradual loss of appetite, nervousness, and finally practical paralysis. All these are described in our last report (pp. 462-474, plates xlix and lii).

It is important to note that these symptoms in the pigs were not always accompanied by a corresponding decrease in weight. Also it was found that, except in advanced cases, the condition of the internal organs was practically normal from a feeder's standpoint. Dr. Hadwen, in his examination of the diseased pigs (p. 474 Annual Report, 1913-14), says: "The pathological changes seen in the pigs fed one hundred days were, as a rule, insignificant."

It was, in fact, one of the surprises of the investigation that pigs, so obviously badly affected externally, should show, to the layman at any rate, comparatively few internal lesions. One lesion, however, was marked, and that was the softness of the bones. In this connection we must refer again to the findings of Hart, McCollum, and

[1] Annual Report, Agri. Exp. Station, Wisconsin, Univ., 1908-9, Research Bull. 1.

Fuller, already mentioned. In their chemical analyses they found that the internal organs of phosphorus starved pigs showed a normal amount of phosphorus, but that the bones were very deficient. For the sake of clearness we quote a few figures from their bulletin.

	Lot 1.	Lot 2.
	Phosphorus starved.	Standard ration.
Per cent phosphorus in blood	·24	·28
Per cent phosphorus in leg muscle	·93	·78
Per cent phosphorus in liver	1·43	1·27
Breaking strength of thigh	·63	1·60
Ash content, per cent	31·	46·

From these it will be seen that phosphorus-starved pigs showed a normal amount of phosphorus in the soft parts of the body, but that it was in the bones that the deficiency became apparent. From which they conclude that the animals are able to draw this element from the skeleton for the use of the body.

These facts seem to have a direct bearing on our results with rice meal. As stated above, the internal organs of the diseased pigs were normal except where extreme debility had set in. The pigs continued to make gains in some cases, after the lameness and other symptoms had appeared. The bones, however, were invariably soft and spongy. They could be bent with ease or cut through with an ordinary butcher-knife. In some cases even the skull bones could be cut into with comparative ease. This condition would appear to indicate that the pigs, deprived of their normal amount of phosphorus, were drawing this element from the bones for the up-keep of the body.

With regard to the distribution of phosphorus in the growing pig, we are fortunate in being able to refer to the recent work of Williams and Emmett[1]. In a very complete series of analyses they find the percentage increase of phosphorus in the various parts of the bodies of growing pigs to be as follows:—

Increase of body weight . . . pounds.	51 to 195
Per cent increase of phosphorus in entire body	320·9
Per cent increase of phosphorus in skeleton	457·7
Per cent increase of phosphorus in meat	107·0
Per cent increase of phosphorus in offal and blood	61·0

The experiments extend over a period of twenty-seven weeks, the pigs being 18 weeks old at the commencement, and 43 weeks at the end of the period. The distribution of phosphorus in the various parts of the body showed a very marked change during growth. The phosphorus in the boneless parts decreased about one-half in proportion to body weight; while that in the skeleton increased about one-half.

[1] Bull. No. 171, Univ. of Illinois, Agric. Exp. Station, June, 1914.

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PHOSPHORUS per 100 pounds live weight.

—	Young Pig.	Old Pig.
	Grams.	Grams.
Skeleton	176·66	262·66
Boneless meat	64·57	35·58
Offal and blood	30·98	13·26

From the feeder's standpoint these figures are valuable, since they emphasize the importance of phosphorus in building up the framework of the young growing hog, and the consequent injury which might be caused by a diet (such as rice meal) which is apparently deficient in this element.

The application of these facts to our problem is not far to seek. The symptoms in our pigs fed on rice meal are apparently those of phosphorus starvation. The lameness and nervousness, condition of bones, comparative lack of internal lesions, all point in this direction. That a lack of phosphorus in the ration could produce such injurious results is not to be doubted, when we consider the age of the pigs, and the necessity of phosphorus for the proper growth of the young animal.

As an illustration we give here the protocols of three trials. These properly belong to last year's work, but were not complete at the time of publication.

In all, six lots were used, four pigs in each lot. These can be grouped as follows:—

In lots 15 and 16, where rice meal was fed in equal quantities with chop, both lots getting the same quantity of green food, lot 15 received dried blood, and lot 16 skim-milk. Both lots became so badly diseased that they were condemned. However, lot 15 made an average daily gain of ·07 pound, while lot 16 lost ·002 pound per day.

SUMMARY—Lots 15 and 16.

		Lot 15.	Lot 16.
		Pen 29.	Pen 27.
Ration.		Rice meal, Chop, Dried blood, Green food.	Rice meal, Chop, Milk, Green food.
Nutritive ratio of ration		1 : 3·8	1 : 5·4
Number of pigs in pen		4	4
Average age at beginning of period	Days	84	96
Total weight at beginning of period	Lb.	160	234
Total live weight at end of period	"	191	230
Average daily gain per pig	"	·07	·00
Duration of feeding period	Days	105	105
Food consumed for 100 pounds gain:			
Rice meal	Lb.	722·58	......
Chop	"	722·58	......
Dried blood	"	290·32	......
Green food	"	3,387·09	......

In lots 17 and 18, wheat shorts were substituted for chop. In lot 18, where dried blood was substituted for milk, the gain was practically nil. In both 17 and 18 the

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pigs became diseased, but in the former, where skim-milk was used they made gains in spite of this. The combination of rice meal and dried blood was far more unprofitable than that of rice meal and milk. The experience of last year's work proved the same (lots 3, 7, 9, and 13; report for 1913-14).

SUMMARY—Lots 17 and 18.

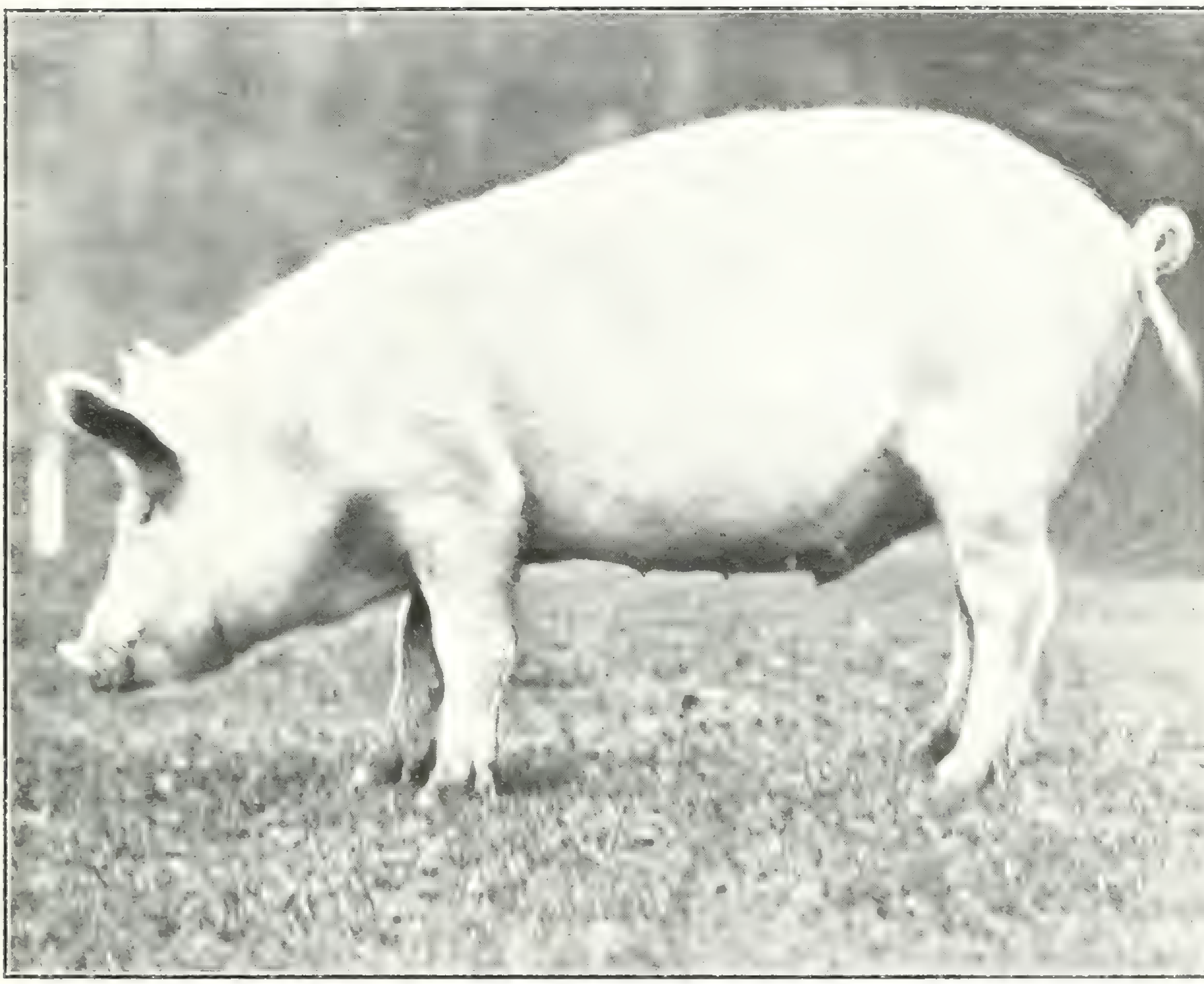
		Lot 17.	Lot 18.
		Pen 26.	Pen 28.
Ration.		Rice meal, Wheat Shorts Milk, Green food.	Rice meal, Wheat Shorts, Dried blood Green food.
Nutritive ratio of ration		1 : 4·9	1 : 3·4
Number of pigs in pen		4	4
Average age at beginning of period	Days	96	84
Total weight at beginning of period	Lb.	250	155
Total live weight at end of period	"	439	161
Average daily gain per pig during period	"	·36	·03
Duration of feeding period	Days	105	105
Food consumed for 100 pounds gain:			
Rice meal	Lb.	150·79	2,766·6
Wheat shorts	"	150·79	2,766·6
Milk	"	687·83	....
Dried blood	"	....	1,133·3
Green food	"	687·83	17,500·

AGASSIZ.

Brood sows and Cabins in which they wintered. Experimental Station, Lacombe.

Agassiz, B.C. Young Sows wintered in Cots in the Bush. Note general condition after having been fed on clover ensilage and one third their usual grain ration for several weeks.

Agassiz, B.C. Pig 1, Pen 46. Fed rice meal, mangels, dry blood, and skim milk.



Agassiz, B.C. Pig 1, Pen 47. Fed rice meal, dried blood, skim milk and ground phosphate rock.

These pigs were litter mates and pig 1, pen 46, was the better pig of the two at the beginning of the feeding period. Pictures were taken before end of period. This illustrates the general effect of phosphorus on the rice meal ration.

In the next trial, where rice meal and wheat shorts were compared, in combination with dried blood and green food, lot 19, receiving wheat shorts, made average gains and remained perfectly healthy; lot 20, receiving rice meal, made some gains but became badly diseased.

SUMMARY—Lots 19 and 20.

		Lot 19.	Lot 20.
		Pen 30.	Pen 31.
Ration.		Wheat shorts, Dried blood, Green food.	Rice meal, Dried blood, Green food.
Nutritive ratio of ration		1 : 3·15	1 : 4·5
Number of pigs in pen		4	4
Average age at beginning of period	Days	97	97
Total weight at beginning of period	Lb.	177	182
Total weight at end of period	"	587	417
Average daily gain per pig	"	·78	·45
Duration of feeding period	Days	130	130
Food consumed for 100 pounds gain:			
Wheat shorts	Lb.	320·24	....
Rice meal	"		387·66
Dried blood	"	31·707	55·31
Green food	"	317·073	553·19
Cost to produce 100 pounds gain	$	4.80	6.86
Weights of viscera:			
Hearts and lungs	Lb.	8·7	8·2
Livers	"	12·5	8·0
Remainder	"	83·9	66·7
Total	"	105·1	82·9

Of the six lots reported on, five were fed rice meal in different proportions. Two lots became so diseased that they were worthless. Three made slight gains, though they all became diseased, and the cost of gain was such as to put profit out of the question. The sixth, fed wheat shorts, made normal gains at a normal cost, and remained perfectly healthy throughout. These results coincide with the work reported on last year.

With these facts in view, a series of ten trials, involving twenty-four lots or one hundred and thirty pigs, was carried out during the year. The main objects were to discover:—

1. The effect of feeding inorganic phosphorus with the various rations containing rice-meal.
2. The best form of inorganic phosphorus to feed.
3. The amount required to overcome the ill effects of rice-meal.

Description of hogs used.—The hogs used for this year's work were of much better grade than those used last year. Most of them were pure-bred Yorkshires, taken from litters raised on the Experimental Farm. They were selected with the object of having age, weight, and condition as nearly uniform as possible throughout

the entire trial; though, with the large number of pigs involved through the year, there was necessarily some variation. As a rule the pigs weighed about 50 pounds at the beginning of the feeding period. It was our aim to have feeding periods last one hundred days.

Housing and Management.—The pigs were fed indoors in a building, which, although rough, was well lighted and ventilated. The pens were cleaned out every day, and fresh straw bedding put down. The pigs were fed three times a day and were kept well supplied with water; a feed of soft coal to take the place of charcoal was given twice a week. They were regularly inspected by Dr. S. Hadwen, who also examined the pigs when slaughtered.

Complementary Foods.—The principal form of phosphorus used was that contained in ground phosphate rock. Basic slag, precipitated calcium phosphate, and a mixture of the first two, were also fed. Working on the principle that potash and wood ashes are good for hogs, certain small lots were given muriate of potash, and others were fed a mixture of ground phosphate rock, basic slag, and muriate of potash, to which we shall refer hereafter as mineral mixture. We might state here that the addition of muriate of potash gave negative results in every case. With regard to amounts, the pigs received approximately 20 grams a day of the crude material throughout the trials. This amount was mixed with the grain ration once a day. The addition of these minerals did not appear to change the palatability of the foods, judging by the behaviour of the pigs.

Following are the protocols of our experiments with phosphorus, fed in conjunction with rice meal in various rations, and some of the control pens.

We give a short discussion of each experiment, to which is appended the protocol in detail:—

Trial 1, Lots 21a., 21b., 22.

THE EFFECT OF GROUND PHOSPHATE ROCK AS A COMPLEMENTARY FOOD TO RICE MEAL. CONTROL FED WHEAT SHORTS.

All three lots were fed dried blood, skim-milk, and green food. Lot 21A, fed rice meal, although making a daily gain of ·31 pound per pig, at a cost of $9.45 per 100 pounds, became diseased and totally disabled. Lot 21B, which received ground phosphate rock with the rice meal, made an average daily gain of ·775 pound, at a cost of $5.28 per 100 pounds, while lot 22, fed wheat shorts, gained ·93 pound daily, at a cost of $5.09 per 100 pounds. Here the combination of ground phosphate rock with rice meal entirely prevented the disease in the hogs, and the production compared favourably with wheat shorts; this was the first case in our experience where rice meal as a total grain ration failed to produce disease. Lot 21B made normal gains at a normal cost, and remained healthy; while lot 21A made low gains, at high cost and became diseased.

Summary—Lots 21A, 21B and 22.

		Lot 21A.	Lot 21B.	Lot 22.
		Pen 33.	Pen 47.	Pen 32.
Ration.		Rice meal, Dried blood, Milk, Green food,	Rice meal, Dried blood, Milk, Green food, Ground phosphate rock.	Wheat shorts, Dried blood, Milk. Green food.
Nutritive ratio of ration		1 : 3·9	1 : 6·40	1 : 3·03
Number of pigs in pen		4	4	4
Average age of pigs at beginning of period	Days	75	118	72
Total weight at beginning of period	Lb.	149	294	145
Total weight at end of period	"	310	604	632
Average daily gain per pig	"	·31	·775	·93
Duration of period	Days	130	100	130
Food consumed for 100 pounds gain:				
Rice meal	Lb.	390·06	328·06	
Wheat shorts	"			269·61
Dried blood	"	62·11	14·51	26·69
Milk	"	807·45	177·4	266·94
Green food	"	807·45	322·6	266·94
Ground phosphate rock	Grs.		2,580	
Cost to produce 100 pounds gain	$	9.45	5.28	5.09
Weights of viscera:				
Hearts and lungs	Lb.	4·3	9·7	10·
Livers	"	4·8	10·1	11·8
Remainder	"	40·4	64·2	83·5
Totals	"	49·5	84·	105·3

Trial 2, Lots 23 and 24.

THE EFFECT OF PHOSPHORUS IN A RATION CONTAINING ONE-THIRD RICE MEAL.

This was the first trial where rice meal was fed in as small a proportion as one-third of the ration. As will be seen from the protocols, both lots made reasonable gains at a reasonable cost, though lot 24, which received phosphorus, proved the more profitable. In the matter of condition, however, the difference was more marked. The pigs in lot 23 became diseased within periods varying from fifty-eight to seventy days. One pig died at thirty-eight days; although this was diseased, we cannot say that rice meal caused its death. With rice meal in this proportion with shorts, the disease is undoubtedly delayed, but as certainly makes its appearance. Lot 24, fed exactly the same ration, with the addition of ground phosphate rock, remained perfectly healthy throughout.

Summary—Lots 23 and 24.

		Lot 23.		Lot 24.	
		Pen 52.	Pen 35.	Pen 36.	Pen 53.
Ration.		Rice meal, Wheat shorts, Milk, Dried blood Green food.	Rice meal, Wheat shorts, Milk, Dried blood, Green food.	Rice meal, Wheat shorts, Milk, Dried blood, Green food, Ground phosphate rock.	Rice meal, Wheat shorts, Milk, Dried blood, Green food. Mineral mixture.
Nutritive ratio of ration		1 : 4·28	1 : 4·04	1 : 4·29	1 : 4·28
Number of pigs in pen		4	4	4	4
Average age of pigs at beginning of period	Days	120	95	95	122
Total weight at beginning of period	Lb.	260	232	278	250
Total weight at end of period	"	532	443	515	612
Average daily gain per pig	"	·68	·837	·705	·905
Duration of period	"	100	84	84	100
Food consumed for 100 pounds gain:					
Rice meal	Lb.	133·46	107·05	126·875	100·28
Wheat shorts	"	266·91	214·22	253·765	200·56
Milk	"	202·22	226·095	164·31	151·93
Dried blood	"	16·54	22·60	16·428	12·43
Green food	"	347·42	452·19	359·46	261·05
Ground phosphate rock	Grs.	....	....	2,913·155	....
Mineral mixture	$	....	....	....	3314·9
Cost to produce 100 pounds gain	$	6.37	5.76	6.14	4.99
Weights of viscera:					
Hearts and lungs	Lb.	10·9	8·0	8·10	8·9
Livers	"	9·9	8·7	8·7	10·5
Remainder	"	61·1	57·9	65·6	67·8
Totals	"	81·9	74·6	82·40	87·2

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Trial 3, Lots 25 and 26.

A comparison of wheat shorts and rice meal, both combined with ground phosphate rock.

In this trial, rice meal constituted the complete grain ration in lot 25, and wheat shorts in lot 26, and an equal quantity of ground phosphate rock was supplied in each case. It will be noted that the pigs fed rice meal made slightly larger daily gains, but were a little more costly than those fed wheat shorts. However, the pigs in lot 25 were a little heavier than those in 26 at the beginning of the period, although they were from the same litters. During the period all the pigs in the trial remained healthy, with the exception of one in lot 25 (rice meal), which became stiff in the hind-legs and refused food, but recovered in twenty-four hours. This occurred fifty-two days from the commencement of the feeding period, which is usually the critical time. It was the most rapid and permanent recovery observed in any rice meal fed hog. These results show rice meal, when combined with phosphorus, almost equal to wheat shorts, combined with the same element. However, the performance of lot 26 showed no advantage over other pens where wheat shorts were fed without phosphorus; which indicates that the addition of phosphorus to wheat shorts was of no particular benefit. This also goes to show that an excess of phosphorus beyond the needs of the body, though of no apparent benefit, produces no ill effects.

Summary—Lots 25 and 26.

		Lot 25.	Lot 26.
		Pen 37.	Pen 38.
		Rice meal, Milk, Dried blood. Green food, Ground phosphate rock.	Wheat shorts Milk, Dried blood Green food, Ground phosphate rock.
Nutritive ratio of ration		1 : 6·17	1 : 3·58
Number of pigs in pen		4	4
Average age of pigs at beginning of period	Days	95	95
Total weight at beginning of period	Lb.	533	510
Average daily gain per pig	"	·782	·732
Duration of feeding period	Days	84	84
Amount of food consumed for 100 pounds gain:			
Rice meal	Lb.	350·5	.... ..
Wheat shorts	"		356
Milk	"	171	165
Dried blood	"	17·10	16·5
Green food	"	343	330·5
Ground phosphate rock	Grs.	2,740·5	2,647·5
Cost to produce 100 pounds gain	$	5·66	5.61
Weights of viscera:			
Hearts and lungs	Lb.	9·1	9·0
Livers	"	9·9	10·4
Remainder	"	60·80	66·10
Totals	"	79·8	85·5

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Trial 4, Lots 27 and 28.

A COMPARISON OF WHEAT SHORTS AND RICE MEAL, COMBINED WITH A LIMITED QUANTITY OF CALCIUM PHOSPHATE.

As in trial 3, rice meal and wheat shorts constituted the total grain ration: with each, 3 grams of precipitated calcium phosphate was supplied to each pig per day instead of 20 grams of the phosphate rock. In lot 28 (wheat shorts), the pigs made reasonable gains at a cost of $5.97 per 100 pounds and remained healthy throughout. In lot 27 (rice meal), the pigs made about half the daily gain of lot 28: the cost of production was $7.41 per 100 pounds. Twenty-five days from the beginning of the period two pigs showed the disease, and later the other two showed the same symptoms, which gradually became worse till the fortieth day, when all four showed well-marked evidence of the disease. On this date the quantity of phosphorus was doubled, and the effect was almost immediately noticed. By the forty-eighth day the pigs had practically recovered and remained apparently healthy until the seventy-ninth day, when the symptoms reappeared and gradually became worse, until, at the end of the period, the pigs showed all the typical symptoms of the disease, although not to an extreme degree. This leads us to believe that the amount of phosphorus supplied with the rice meal ration was not sufficient for the needs of the animal body, since when the quantity was doubled the symptoms disappeared for a time but reappeared towards the end of the period.

As in the case of lot 26 in trial 3, the calcium phosphate did not appear to have any effect, beneficial or otherwise, upon wheat shorts as a food.

Summary—Lots 27 and 28.

		Lot 27.	Lot 28.
		Pen 44.	Pen 45.
Ration.		Rice meal, milk, dried blood, green food, calcium phosphate.	Wheat shorts, milk, dried blood, green food, calcium phosphate.
Nutritive ratio of ration		1 : 5·6	1 : 3·58
Number of pigs in pen		4	4
Average age of pigs at beginning of period	days	114	101
Total weight at beginning of period	lb.	275	247
Total weight at end of period	"	462	554
Average daily gain per pig	"	·445	·73
Duration of period	days	105	105
Amount of food consumed for 100 pounds gain:			
Rice meal	lb.	431·55	
Wheat shorts	"		370·68
Milk	"	275·40	167·75
Dried blood	"	27·54	16·775
Green food	"	550·8	335·5
Calcium phosphate	grs.	1,043·48	635·34
Cost to produce 100 pounds gain	$	7.41	5.97
Weights of viscera:			
Hearts and lungs	lb.	8·1	10·
Livers	"	7·8	9·4
Remainder	"	53·4	64·8
Total	"	69·3	84·2

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Trial 5, Lots 29 and 30.

THE EFFECT OF GROUND PHOSPHATE ROCK IN A RATION OF RICE MEAL ONE-THIRD, AND BARLEY TWO-THIRDS.

The combination of rice meal and barley appeared to be an unprofitable one, even when complemented with ground phosphate rock. However, lot 30, receiving the phosphate, made larger and more economical gains than lot 29. They were also in better condition throughout the entire trial, although, seventy-seven days after feeding commenced, their skins became discoloured and they had a generally unthrifty appearance, though showing no actual symptoms of the disease. In contrast to this, lot 29 showed the first symptoms at thirty-seven days, and they were all stiff before the forty-sixth day. They continued to get worse till the end of the period; one pig died before the end of the trial.

Summary—Lots 29 and 30.

		Lot 29.	Lot 30.
		Pen 40.	Pen 41.
Ration		Rice meal, barley, dried blood, milk, green food.	Rice meal, Barley, dried blood, milk, green food, ground phosphate rock.
Nutritive ratio of ration		1 : 5·	1 : 5·81
Number of pigs in pen		4	4
Average age of pigs at beginning of period	days.	116	116
Total weight at beginning of feeding period	lb.	225	327
Total weight at end of period	"	376	542
Average daily gain per pig	"	·689	·73
Duration of period	days.	73	73
Amount of food consumed for 100 pounds gain:			
Rice meal	lb.	290·325	122·
Barley	"	581·285	244·
Dried blood	"	74·54	15·95
Milk	"	745·41	159·5
Green food	"	1,490·82	319·5
Ground phosphate rock	grs.		2,559·5
Weights of viscera:			
Hearts and lungs	lb.	5·4	8·9
Livers	"	6·7	8·8
Remainder	"	31·4	56·1
Totals	"	43·5	73·8

Trial 6, Lots 31 and 32.

THE EFFECT OF GROUND PHOSPHATE ROCK IN A RATION OF RICE MEAL, BARLEY, AND WHEAT SHORTS (EQUAL PARTS).

In this trial, lot 32 contained twice as many pigs as lot 31. With regard to gains, lot 32, receiving phosphate, gave a larger average daily gain at a cheaper price than lot 31. Each lot contained one very poor, blind grade Berkshire barrow. Of these two the one receiving the phosphate died, whereas the other, though badly diseased, remained alive to the end of the feeding period. We cannot blame the feeding for the condition of either pig as it is extremely doubtful if, under the best conditions, these pigs would have been profitable.

In lot 32, fed on phosphate, all the pigs with the one exception just mentioned, grew well and were in excellent condition when slaughtered; whereas in lot 31, forty-eight days from the beginning the pigs showed typical symptoms, which gradually got worse up to the end of the trial.

Summary—Lots 31 and 32.

Ration.		Lot 31.	Lot 32.	
		Pen 42.	Pen 43.	Pen 55.
		Rice meal, barley, wheat shorts, dried blood, milk, green food.	Rice meal, barley, wheat shorts, dried blood, milk, green food, ground phosphate rock.	Rice meal, barley, wheat shorts, dried blood, milk, green food, ground phosphate rock.
Nutritive ratio of ration		1 : 4·97	1 : 5·01	1 : 5·03
Number of pigs in pen		4	4	4
Average age of pigs at beginning of period	days.	130	116	120
Total weight at beginning of period	lb.	288	293	254
Total weight at end of period	"	485	502	577
Average daily gain per pig	"	·674	·715	·807
Duration of feeding period	days.	73	73	100
Food consumed for 100 pounds gain:				
Rice meal	lb.	139·	125·	112·38
Barley	"	139·	125·	112·38
Wheat shorts	"	139·	125·	112·38
Dried blood	"	18·75	16·45	13·93
Milk	"	187·5	164·5	170·28
Green food	"	375·	329·	292·57
Ground phosphate rock	grs.		1,345·2	3,715·17
Cost to produce 100 pounds gain	$	7·98	7·38	6·33
Weights of viscera:				
Hearts and lungs	lb.	9·0	7·5	10·4
Livers	"	9·2	8·5	10·1
Remainder	"	54·1	54·7	59·5
Totals	"	72·3	70·7	80·

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Trial 7, Lots 33 and 34.

EFFECT OF BASIC SLAG IN A RATION CONTAINING RICE MEAL, BARLEY, AND SHORTS, (EQUAL PARTS).

In this trial it was impossible to get pigs of a comparable weight and age. Lot 33, which did not receive any phosphorus, was given a decided advantage in having older, stronger, and better-conditioned pigs. However, in spite of this advantage, after sixty days the characteristic lameness appeared. Lot 34, receiving the phosphate in the form of basic slag, made a smaller average daily gain, though at a cheaper rate per 100 pounds. This was to be expected with younger animals; however, with the addition of the basic slag they withstood the rice meal feeding better, and remained in good condition throughout the trial.

Summary—Lots 33 and 34.

		Lot 33.	Lot 34.
		Pen 54.	Pen 56.
Ration.		Rice meal, barley, wheat shorts, milk, dried blood, green food.	Rice meal, barley, wheat shorts, milk, dried blood, green food. basic slag.
Nutritive ratio of ration		1 : 5·51	1 : 5·03
Number of pigs in pen		4	4
Average age of pigs at beginning of period	days.	168	101
Total weight at beginning of feeding period	lb.	495	229
Total weight at end of period	"	906	532
Average daily gain per pig	"	·822	·795
Duration of feeding period	days.	100	100
Food consumed for 100 pounds gain:			
Rice meal	lb.	136·25	114·15
Barley	"	136·25	114·15
Wheat shorts	"	136·25	114·15
Milk	"	133·82	172·95
Dried blood	"	10·95	14·15
Green food	"	230·	297·17
Basic slag	grs.		3 930·81
Cost to produce 100 pounds gain	$	7·02	6·43
Weights of viscera:			
Hearts and lungs	lb.	12·7	10·7
Livers	"	13·4	9·0
Remainder	"	89·8	58·4
Totals	"	115·9	78·1

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Trial 8, Lots 35 and 36.

EFFECT OF MINERAL MIXTURE IN RATION OF RICE MEAL.

The mineral mixture supplied consisted of: ground phosphate rock, three parts; basic slag, three parts; and muriate of potash, one part, by weight.

Of this the pigs in lot 36 were fed 30 grams per day per pig. Lot 35, fed on rice meal without mineral, was composed of younger and heavier animals, having a decided advantage in every respect. In spite of this, lot 36 gave larger daily gains at a much cheaper rate per pound, and remained perfectly healthy, and the quality of the pork after killing was decidedly superior. In lot 35, fifty-nine days from the beginning, the pigs began to stiffen in the hind legs: they showed loss of appetite, and their hair and skin became very rough; their eyes had the usual staring expression. At the end of eighty-six days the pigs showed every symptom of straight rice-meal feeding. In lot 36, each pig received about 6 grams more phosphorus-bearing material than any pig in the preceding trials. It is worthy of note that this lot (36) was one of the most profitable in the whole series; and, also, that lot 35, with which it is compared, was one of the best rice-meal lots which we have fed.

Summary—Lots 35 and 36.

Ration.		Lot 35.	Lot 36.
		Pen 46.	Pen 51.
		Rice meal, dried blood milk, green food.	Rice meal, dried blood milk, green food, mineral mixture.
Nutritive ratio of ration		1:6·31	1: 6·54
Number of pigs in pen		4	4
Average age of pigs at beginning of period	days.	114	122
Total weight at beginning of period	lb.	296	255
Total weight at end of period	"	512	612
Average daily gain per pig	"	·54	·892
Duration of feeding period	days.	100	10[illegible]
Food consumed for 100 pounds gain:			
Rice meal	lb.	450·46	305
Dried blood	"	20·83	12·60
Milk	"	254·63	154·06
Green food	"	463·42	264·7
Mineral mixture	gms		3,361
Cost to produce 100 pounds gain	$	7·26	4·94
Weights of viscera:			
Hearts and lungs	lb.	8·1	9·3
Livers	"	7·0	10·9
Remainder	"	47·3	73·3
Totals		62·4	93·5

TRIAL 9, LOTS 37 AND 38.

EFFECT OF GROUND PHOSPHATE ROCK UPON RATION OF GROUND BARLEY.

It has been already noted that the mixture of rice-meal and barley gave the poorest returns of any rice-meal mixture. A trial was therefore made to see if barley would be improved by the addition of ground phosphate rock. As will be seen from the protocols, there was very slight difference in favour of the lot fed phosphate. It must be noted, however, that pig No. 1 in lot 37, fed no phosphate, became very suddenly lame and could not rise sixty-eight days from the beginning. At the time of slaughter it was found that both femora had been broken, and at that time were partly healed. This was decidedly to the disadvantage of lot 37.

SUMMARY—Lots 37 and 38.

Ration.		Lot 37.	Lot 38.
		Pen 48.	Pen 49.
		Barley, dried blood milk, green food.	Barley, dried blood milk, green food ground phosphate rock.
Nutritive ratio of ration		1: 5·73	1: 5·86
Average age of pigs at beginning of period	days	118	118
Total weight at beginning	lb.	302	288
Total weight at end of period	"	639	681
Average daily gain per pig	"	·842	·982
Duration of feeding period	days	100	100
Food consumed for 100 pounds gain:			
Barley	lb.	338·87	318·32
Dried blood	"	13·06	11·45
Milk	"	163·2	139·94
Green food	"	296·73	254·2
Ground phosphate rock	grs.		2,035·6
Weights of viscera:			
Hearts and lungs	lb.	8·8	9·5
Livers	"	9·7	9·5
Remainder	"	60·1	59·4
Totals		78·6	78·4

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Trial 10, Lots 39, 40, 41 and 42.

A comparison between the different forms of phosphorus and minerals used with rice meal.

This experiment was an attempt to determine the relative merits of ground phosphate rock, basic slag, muriate of potash, and the mineral mixture, as complementary foods in a ration containing rice meal. There were four lots in all. Of these, Nos. 39, 40, and 42, getting respectively ground phosphate rock, basic slag, and the mineral mixture, all made good average daily gains at a reasonably low cost. As will be seen from the protocols the results are slightly in favour of the ground phosphate rock. Lot 41 received muriate of potash, and made low daily gains at a very high cost. This would indicate that the muriate of potash has no power to counteract the ill-effects of rice meal. In the matter of general health and condition, the same may be said, since those receiving ground phosphate rock and basic slag went through the trial without showing any symptoms of the disease, while those receiving mineral mixture showed only slight symptoms on two different occasions, the seventy-seventh and the ninety-seventh days. On the other hand, the pigs receiving the potash developed symptoms at sixty-six days, which became acute, and by the end of the period they had to be helped to the trough.

Summary—Lots 39, 40, 41, and 42.

		Lot 39.	Lot 40.	Lot 41.	Lot 42.
		Pen 55.	Pen 56.	Pen 57.	Pen 58.
Ration.		Rice meal, barley, W. shorts, milk, dried blood green food, ground phosphate rock.	Rice meal, barley, W. shorts, milk, dried blood, green food, basic slag.	Rice meal, barley, W. shorts, milk, dried blood, green food, Muriate of potash.	Rice meal, barley, W. shorts, milk, dried blood, green food, mineral mixture.
Nutritive ratio of ration		1: 5·03	1: 5·03	1: 4·95	1: 5·08
Average age of pigs at beginning of period	days	120	101	77	77
Total weight at beginning of period	lb.	254	229	234	227
Total weight at end of period	"	577	532	389	496
Average daily gain per pig per day	"	·807	·795	·387	·269
Duration of feeding period	days	100	100	100	100
Food consumed for 100 pounds gain—					
Rice meal	lb.	112·38	114·15	169·03	107·83
Barley	"	112·38	114·15	169·03	107·83
Shorts (wheat)	"	112·38	114·15	169·03	107·83
Milk	"	170·28	172·95	550	550
Dried blood	"	13·93	14·15	29·03	16·72
Green food	"	292·57	297·17	335·5	236·06
Ground phosphate rock	grs.	3,715·17			
Basic slag	"	.....	3,930·81	1,936	
Muriate of potash	"	.....	.....	.....	4,461
Mineral mixture	"	.....	.....	.....	.....
Cost to produce 100 pounds gain	$	6·33	6·43	9·27	6·31
Weights of viscera—					
Hearts and lungs	lb.	10·4	10·7	7·3	9·4
Livers	"	10·1	9·0	6·9	9·2
Remainder	"	59·5	58·4	38·4	68·0
Totals	"	80·	78·1	52·6	86·6

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SUMMARY OF RESULTS.

The results of the experiments show a distinct benefit from feeding inorganic phosphorus with rice-meal. In all, one hundred and twenty-nine pigs were put through the trials. Of these, forty-nine were fed rice-meal in various proportions with other grains; all these pigs developed the typical diseased condition previously noticed in rice-meal fed pigs. Phosphorus in different forms was given as a complementary food to the above ration with forty-eight hogs. With one exception these hogs remained perfectly healthy throughout the trials, and showed no ill-effects from the rice-meal. Calcium phosphate in smaller quantities fed to four pigs failed to counteract completely the injurious effects of a ration of rice-meal. Liberal quantities of muriate of potash were absolutely ineffective in the case of pigs fed on a ration containing rice-meal.

Finally, twenty-four control pigs, fed on rations not containing rice-meal, remained normal and healthy throughout.

CONCLUSIONS.

(1) The injurious effects of rice-meal, in proportions as low as one-third of the total grain ration, have received further confirmation.

(2) Inorganic phosphorous added to the ration containing rice-meal, is capable of counteracting these injurious effects.

(3) From the work done, ground phosphate rock appeared to give better results than the other forms used.

(4) More work is necessary in this connection; and consequently investigations are being made as to the different forms of inorganic phosphorus and the quantities necessary for the utilization of rice-meal as a food for fattening and breeding hogs.

ADDITIONAL NOTES ON PATHOLOGICAL LESIONS OF PIGS FED RICE MEAL.

By S. Hadwen, D.V.Sci., Veterinary Research Laboratory, Agassiz, B.C.

At Mr. Moore's request I am adding a short report on my post-mortem findings with pigs fed on rice meal.

The following notes are an amplification of the findings which appeared in last year's report. As before, all hogs were examined at the time of slaughter, and in certain of the pens, lesions were encountered similar to those reported last year.

In my first report I inclined to the theory that toxins were responsible for the lesions encountered. This idea has been, in my opinion, fully justified by subsequent examinations, though the primary cause of the disease is, without doubt, incomplete nutrition. Owing to this state of malnutrition, the alimentary tract does not function normally, and toxic products are absorbed into the system; these are caused either by the direct action of bacteria or by the fermentation of the ingesta.

A number of cases of primary hydropericardium were encountered. The effusion in most cases had dried up, leaving the pericardial sac firmly adherent to the heart. Evidently, during the feeding trials, there is more or less dropsy accompanied by a œdematous condition of the lungs. The effusion into the pericardium was invariably clear and limpid, denoting that it was not of secondary origin. According to Stengel, primary pericarditis occurs in association with acute rheumatism, septic infection, and nephritis, either acute or chronic.

LESIONS OF THE ALIMENTARY TRACT.

Lesions were found similar to those before described. It is well, however, to bear in mind that such lesions are somewhat hard to interpret. Nearly all the literature available, on the subject, is medical literature: the medical man here has a decided

advantage over the veterinarian, especialy in diagnosing symptoms of stomach troubles. In some cases there was undoubtedly dilatation of the stomach; this was noticed on post-mortem examination. It was very noticeable in one pen; the stomachs of these pigs were filled with food and distended with gas. The mucous membranes in this cast were not bile-stained, but were catarrhal; however, these four pigs grew well, having received phosphorus in addition to rice-meal. In striking contrast to this, the pigs in the other pen, fed no phosphorus, did not grow well, developed a neuritis, and lost the use of their limbs. When they were killed the four stomachs were found to be shrunken and hard, contained bits of straw and other refuse, were bile-stained throughout, and covered with a sticky, glairy mucus, as was also the duodenum. These two cases illustrate the difficulty of diagnosis. The first pen was profitable and, from a feeder's point of view, healthy, though the alimentary canal was not functioning normally; the second lot of pigs were distinctly unprofitable, looked unthrifty, and showed well-marked internal lesions.

According to Smith,[1] bile is very seldom found in a healthy stomach. In the course of our examinations we have encountered gastric ulcers. According to the above writer, " the lesions of the gastric mucous membrane, produced by bile in the presence of an excess of ·5 per cent of hydrochloric acid, consist of necrosis of the epithelium and interglandular tissue, with hemorrhages into the mucous membrane, as the result of which small superficial ulcers may form." He says that the presence of mucus assists in protecting the stomach. This is borne out by the observations made here. Intermediate stages have also been noticed.

The most marked external symptom is the extraordinary growth of hair in pigs fed on rice-meal. The hair grows long, coarse and dirty, with a tendency to curl (see figs. 1 and 2, Report of Superintendent). In these cases bone-formation proceeds irregularly, and the bones become very soft; but these lesions were fully described before. These symptoms are undoubtedly secondary and are due to malnutrition.

The experiments are being continued, and no doubt further opportunities for the study of this disease will be forthcoming. The work seems worthy of effort, not only from the feeder's standpoint but also from the scientific side; especially at this time, when great interest is being taken in nutrition diseases, especially beri-beri in man, which the condition described so closely resembles.

[1] An experimental study of the relation of bile to ulceration of the mucous membrane of the stomach. G. M. Smith, Jour. Med. Research, vol. xxx, No. 2, pp. 147-183.

AGASSIZ.

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE.

EXPERIMENTAL FARMS

REPORTS FROM THE

DIVISION OF HORTICULTURE
DIVISION OF CEREALS
DIVISION OF BOTANY
DIVISION OF BEES
DIVISION OF FORAGE PLANTS
DIVISION OF POULTRY
DIVISION OF TOBACCO

FOR THE YEAR ENDING MARCH 31, 1915.

PRINTED BY ORDER OF PARLIAMENT.

OTTAWA
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EXCELLENT MAJESTY
1916

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VOLUME II

SECTION B—*Continued.*

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF HORTICULTURE

For the Year ending March 31, 1915

PREPARED BY

The Dominion Horticulturist, Central Farm, Ottawa. - W. T. Macoun.

Superintendent—

Experimental Station, Charlottetown, P.E.I. - - - - J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S. - - - - - - - W. W. Baird, B.S.A.
Experimental Station, Kentville, N.S. - - - - - - W. S. Blair.
Experimental Station, Fredericton, N.B. - - - - - W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, Q. Jos. Bégin.
Experimental Station, Cap Rouge, Que. - - - - - G. A. Langelier.
Experimental Station, Lennoxville, Que. - - - - - J. A. McClary.
Experimental Farm, Brandon, Man. - - - - - - - W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask. - - - - - T. J. Harrison, B.S.A.
Experimental Station, Rosthern, Sask. - - - - - - W. A. Munro, B.A., B.S.A.
Experimental Station, Scott, Sask. - - - - - - - M. J. Tinline, B.S.A. (Acting).
Experimental Station, Lethbridge, Alta. - - - - - W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta. - - - - - - G. H. Hutton, B.S.A.
Experimental Farm, Agassiz, B.C. - - - - - - - P. H. Moore, B.S.A.
Experimental Station, Invermere, B.C. - - - - - - G. E. Parham.
Experimental Station, Sidney, B.C. - - - - - - - S. Spencer (Foreman-Manager).

Experimentalists of Substations at Salmon Arm, B.C., Fort Vermilion, Grouard, Grande Prairie and Forts Resolution and Providence, in northern Alberta.

REPORT OF THE DIVISION OF HORTICULTURE.

OTTAWA, March 31, 1915.

J. H. GRISDALE, Esq., B.Agr.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the twenty-eighth annual report of the Division of Horticulture, being the seventeenth since I took charge of the Division.

There will be found included in this report the reports of the work at the Central Farm, Ottawa, and those which have been written by the Superintendents of the Experimental Farms and Stations at Charlottetown, P.E.I.; Nappan, N.S.; Kentville, N.S.; Fredericton, N.B.; Ste. Anne de la Pocatière, Que.; Cap Rouge, Que.; Lennoxville, Que.; Brandon, Man.; Indian Head, Sask.; Rosthern, Sask.; Scott, Sask.; Lethbridge, Alta.; Lacombe, Alta.; Agassiz, B.C., and Invermere, B.C. There is also a report from Thos. A. Sharpe, Salmon Arm, B.C., and from the Sub-stations at Fort Vermilion, Peace River District, Alta., Grouard, Lesser Slave Lake, Alta., Grande Prairie, and Forts Resolution and Providence in Northern Alberta.

As last year, the report of the work on the Central Farm has been divided into four parts, the more general and introductory part with some results in detail prepared by myself, and the other parts of the report prepared by the assistant in charge of each sub-division, namely, Pomology, Vegetable Gardening, Ornamental Gardening and Plant Breeding. As the assistant in Vegetable Gardening volunteered for active service in November, the Assistant in Pomology, who is temporarily in charge of the vegetable work, completed the report on vegetables, which was already well advanced.

BRANCH FARMS.

The rapidly increasing number of Branch Stations has meant a corresponding increase of work for the Horticultural Division. The new Superintendents are anxious to get assistance from the Horticultural Division in the planning of experiments and the laying out of the orchards and other plantations, and at the older Farms and Stations there is always something in which the Dominion Horticulturist or his assistants can be of service. It is planned to pay one or more visits to each Farm and Station each year.

The writer left home on March 28, 1914, and on April 2 visited the farm of Mr. Thos. A. Sharpe, Salmon Arm, B.C., who is conducting some experiments in fruits for the Dominion Government. April 3 was spent at the Experimental Farm, Agassiz, B.C. It was decided to remove the few apple trees left in the old orchard as most of them were badly affected with the Apple Tree Anthracnose. The new farmers' orchard and small fruit plantation was in a healthy condition. The Experimental Station at Sidney, Vancouver Island, was visited on April 6. Four days were spent here in laying out and planting the various orchards and plantations. Planting plans prepared by the writer at Ottawa were used. The tree fruits planted included apples, pears, plums, cherries, peaches, apricots, nectarines, quinces, persimmons, oranges, figs, filberts, walnuts and chestnuts. About one-quarter of an acre of holly was planted and the same area of Cascara (*Rhamnus Purshianus*). Plans for experiments in bulb

culture were made. An avenue of tulip trees was planned for the East Saanich road and planted. Several beds for shrubs and herbaceous plants and plantations of rhododendrons were laid out near the lower entrance of the ravine, also a bank of Japanese roses near the Saanich road.

Lethbridge was reached on April 15. It was found that fruit trees had come through the winter well and there was a good promise of apples which later was fulfilled. It was decided to devote about three and a half acres near the Canadian Pacific railway to orchard and garden which would not be irrigated and would serve as a demonstration to settlers, as there is a large area of land in southern Alberta where irrigation is not possible. It was planned at this time to extend the lawn in front of the Superintendent's house to the public road.

April 17 was spent at the Lacombe Station. It was considered advisable to plant willows for windbreaks across the orchard as the latter is still very much exposed. Some more groups of shrubbery were planned on the ornamental grounds. As the shrubbery border along the western boundary, south of the orchard, would be cut off from the rest of the horticultural area owing to fences necessary for stock, it was decided to remove these, and the best of them were utilized for the ornamental grounds in front of the house.

On April 20 the Experimental Station at Scott was visited. A good many of the fruit trees were found injured by winter, but some of the hybrid apples were quite hardy and promise to succeed. Young evergreens came through the winter well. While at Scott I arranged with the Superintendent to have vacant spaces in the apple orchard filled and plum seedlings from Brandon set out. A few more clumps of trees were planned for the ornamental grounds. Many matters relating to the horticultural work were discussed with the Superintendent, as is the case at all the Branch Farms and Stations.

The Experimental Station at Rosthern, Sask., was visited on April 21. A marked improvement was found in the horticultural work there. The hybrid apple trees came through the winter well and promised considerable fruit. It was arranged to have some hedges put across the area devoted to vegetables and the nursery to furnish still more protection.

I was at the Indian Head Farm on April 22. The plantation of young Russian apple seedlings was found in good condition, many of the trees having wintered well. While there I planned three groups of ornamental trees at the south side of the new lawn where the orchards used to be, which I think will make a decided improvement. As the effect of the flower garden was injured to a considerable extent by the position of the meteorological instruments it was decided to move them to the small area near the present office.

April 23 was spent at the Brandon Experimental Farm. As at Indian Head, a difference was noticed in the hardiness of the Russian seedling apple trees in nursery rows, though many had wintered well. It was decided to replace the row of Manitoba maples on the low land between the public road and the maple and spruce avenue with laurel-leaved willow as the former do not do well there. Other matters in regard to the horticultural work were discussed with the Superintendent.

On May 12, 1914, I visited the Experimental Station at Cap Rouge, Que., and found that most of the trees had come through the winter well. The orchards, at present, promise to be a good demonstration that orcharding can be successfully carried on in the vicinity of Quebec. In the orchard which has been planted longest a four-year rotation of vegetables or roots, grain, clover and timothy is being followed between the trees, leaving four feet on each side of the rows for cultivation and cover crop. In the newer orchards planted in 1913 where there are fillers and the trees planted closer, I planned with the Superintendent some cultural experiments. I was again at Cap Rouge on September 23, and found that the trees had made good

growth during the season. I made a number of suggestions to the Superintendent and the foreman in charge of the horticultural work in regard to the care of the various plantations.

The Experimental Station at Ste. Anne de la Pocatière, Que., was visited on May 13 and 14, 1914, when I planned and helped to plant the orchard extension for which the land was prepared last year. I also laid out some small fruit plantations in the orchard area. Most of the fruit trees had apparently come through the winter well, and there is promise of a good orchard here. As the winds are very strong in winter, a row of spruce was planted across the north end of the orchard for a windbreak. I was again at Ste. Anne on September 24 and went over the horticultural work with the Superintendent. Some of the vegetables and flowers did well this year notwithstanding the severe drought. Most of the fruit trees planted in the spring grew, and the orchard on the whole looked well. The land near the front of the Farm where the ornamental grounds will be was being drained.

I was at the Station at Lennoxville, Que., on May 15 and went over the farm with the Superintendent and formed an idea of how the area to be devoted to horticulture might be laid out to the best advantage. It was arranged to plant a few things such as corn, tomatoes and seed of herbaceous perennials. A nursery of ornamental plants had already been planted from material ordered at the Central Farm. In June I was again at Lennoxville with the Director, when the boundaries of the horticultural area were decided upon. On August 19 I visited Lennoxville a third time, and with my assistant, Mr. M. B. Davis, went over the orchard area to find out where inequalities were in view of cultural experiments it was proposed to try. Horticultural matters were also discussed with the Superintendent and gardener.

I arrived at the Experimental Station, Fredericton, N.B., on August 20. Apple, plum, pear and cherry trees planted last spring from a plan which had been prepared at Ottawa were found to be doing well. Two main roads through the proposed ornamental grounds were staked out while I was there. It was decided to try rolling a piece of the natural sod in the meantime and cutting the grass with a lawn mower in 1915.

The Experimental Farm, Nappan, N.S., was visited on August 21. There were a number of scattering plum, pear and cherry trees in the old orchard which were not thriving and which bear little or no fruit, and I suggested that after getting notes on their present condition and past records they should be removed to make room for something that would be likely to do better.

August 22 was spent at the Kentville Experimental Station, and the various plantations were visited with the Superintendent, and most things were found to be doing well. There had been very marked progress at this station since my last visit. Good success had been obtained this year with the Montreal muskmelon at Kentville. Other vegetables and flowers were also doing well. The questions of a better main entrance and something more effective to stop the wash from the hill were discussed with the Superintendent.

On August 25 and 26 I was at the Experimental Station, Charlottetown, P.E.I. Some changes were suggested in the arrangement of the beds at the side of the Superintendent's house to give more lawn in the foreground. Raspberries were still abundant at this date and strawberries were just over. The young orchards are doing very well, but there is little fruit yet. A hedge of *Berberis Thunbergii* was suggested to separate the front lawn from the orchard, which would, we thought, give a better finish to the lawn.

OTTAWA.

MEETINGS, ADDRESSES, AND PLACES VISITED BY THE STAFF OF THE HORTICULTURAL DIVISION.

While it is not possible for the staff of the Horticultural Division to visit all the places to which it seems desirable to go, and to attend all the meetings which it seems important should be attended, an effort is made each year to do considerable work of this kind in order that the Division should be kept in close touch with the work of others and in order that the results of the work of the Horticultural Division should be brought before the people.

On August 4-6, 1914, I attended the annual meeting of the Canadian Horticultural Association at Toronto, Ont., and gave an address on "Hardy Conifers." While attending this meeting, advantage was taken of visiting some of the large florists' plants, among them the Dale greenhouses at Brampton, Ont. While on a visit to the Experimental Station at Lennoxville, Que., on August 19, I made a motor trip through the district to learn what the horticultural conditions were, and passed through Compton, Massawippi, Ayer's Cliff and North Hatley, obtaining a very good idea of the country and the climate of the district.

On September 2, 3, and 4, I attended the fourth Dominion Fruit Conference at Grimsby, Ont. In addition to learning what was possible at the sessions, I participated in the motor trip which was organized for the occasion through the Niagara district, and was able to see many orchards and fruit plantations and the methods adopted by the growers.

When at the Experimental Station, Charlottetown, on August 25, I assisted in judging the flowers at the second annual exhibition of the Floral Association of Prince Edward Island, and on September 24, while visiting the Experimental Station at Ste. Anne de la Pocatière at St. Roch des Aulnaies, Que., I judged the fruit at the exhibition of the L'Islet Horticultural Society at St. Roch des Aulnaies.

On November 13, I gave an address before the annual meeting of the Ontario Fruit Growers' Association at Toronto on "Yields of Varieties of Apples at Different Ages," and on November 11 before the annual meeting of the Ontario Horticultural Association on "Recent Experimental Work and Best Flowers," and a paper on "How to Grow one's own Vegetable Seeds" before the Ontario Vegetable Growers' Association, Toronto, November 10, 1914. An address on "The Life of Apple Trees in the Province of Quebec" was given before the annual meeting of the Quebec Pomological Society, Macdonald College, on December 2, 1914.

On February 9 and 10 I attended "Farmers' Week" at the Agricultural College of Cornell University, Ithaca, N.Y., for the special purpose of listening to the addresses at the meeting of the New York Potato Growers' Association held during that week. I also attended a business meeting of the National Potato Growers' Association.

During February and March I attended meetings and gave addresses at most of the following places in connection with the Government's campaign for "Patriotism and Production," two meetings being held in each place, my subject in most cases being "Gardening in Cities and Towns," though on some occasions I spoke especially on potato culture. In connection with these addresses I advocated a "Patriotic Vegetable Gardening Competition" for cities and towns, and prepared some suggestions in regard to the organization of such. The places and time of meetings were: London, Ont., February 11; Woodstock, Ont., February 12; Brantford, Ont., February 18; Fergus, Ont., February 19; Kingston, Ont., February 25; Belleville, Ont., February 26; Perth, Ont., March 4; Peterborough, Ont., March 5; Richmond, Que., March 1; Cowansville, Que., March 2.

On March 8 I addressed the Ottawa Household League on "Backyard Gardening," and the pupils of the Rideau Street and Osgoode Street schools on March 17 on the same subject, and the Vegetable Growers' Association on "How to Control Injurious Insects" on March 11.

OTTAWA.

Mr. M. B. Davis, Assistant in Pomology, gave an orchard demonstration at Renfrew, Ont., on July 8, 1914, under the auspices of the Renfrew Farmers' Institute. He gave an address on "Co-operation" before the summer meeting of the Quebec Pomological Society at Abbotsford, Que., on September 9, also judging the fruit at the exhibition in connection with this meeting. On November 12 he delivered an address on "Orchard Heaters" before the annual meeting of the Ontario Fruit Growers' Association, Toronto, Ont., and on the same subject before the annual meeting of the Quebec Pomological Society on December 2. He gave an address on "Home Fruit Gardens" at North Gower, Ont., on December 10, and on the 16th on "Fruit Growing" at Burnstown, and on the 17th on the same subject at Gratton, Ont., in the afternoon and evening, the last two being under the auspices of the Renfrew Farmers' Institute. On February 15, 1915, he gave an address at the Short Course at Perth, Ont., in the afternoon, and in the evening an address on "Vegetable Gardening" before the Perth Horticultural Society.

Mr. F. E. Buck, Assistant in Ornamental Gardening, judged the flowers at a number of exhibitions during the year. On July 10, 1914, he judged at an exhibition held at Sidney, B.C.; on September 2 and 3, at the Provincial Exhibition, Quebec; on September 12, at the exhibition of the Smiths Falls Horticultural Society, and on September 15 at the exhibition of the Perth Horticultural Society. During July he visited the Experimental Farms at Brandon, Indian Head, Lethbridge, Agassiz and Sidney for the special purpose of assisting in improving the system of labelling at these places, but particularly at Indian Head. He presented the report of the "Names Committee" at the annual meeting of the Ontario Horticultural Association, Toronto, November 12, 1914, and gave an address at the Short Course in Horticulture, Macdonald College, Que., February 10, 1915, and an address before the Westboro, Ont., Horticultural Society in May and October, 1914, and in March, 1915.

In order to gain information in regard to what others were doing in plant breeding, Mr. A. J. Logsdail, Assistant in Plant Breeding, during the summer of 1914 visited the Horticultural Experiment Station, Vineland, Ont., the College of Agriculture, St. Anthony Park, Minn., the Minnesota Fruit Experiment Station, Zambra Heights, Minn., the College of Agriculture, Brookings, S.D., the College of Agriculture, Ames, Iowa, and the College of Agriculture, Urbana, Ill. He judged the horticultural exhibits at the Horticultural Exhibition, Haileybury, Ont., and at the Agricultural and Horticultural Show, Vankleek Hill, Ont. He also visited the Experimental Station at Lennoxville, Que., in the summer of 1914 to arrange about the growing of some improved vegetables. He gave an address on the "Breeding of Vegetables" before the annual meeting of the Ontario Vegetable Growers' Association, Toronto, Ont., November 10, 1914.

MATTERS OF SPECIAL INTEREST AND IMPROVEMENTS.

The new greenhouses which were not completed at the close of the last fiscal year have now been in use about a year and have proved very satisfactory. Crops of tomatoes, melons, cucumbers, cauliflowers, beans, lettuce, radishes, grapes and strawberries have been grown for experiment, besides many kinds of flowers. There was a fine chrysanthemum show of the best varieties in the autumn of 1914. Five recording thermometers were purchased so that the temperature of the houses at all hours of the day and night would be recorded. The premises above the boiler and potting house are now used for offices. An outside cellar connected with the boiler house was constructed for storing plants in winter.

Four hundred orchard heaters or fire pots for experimental work were purchased and are reported upon elsewhere. A large collection of European grapes was set out, it being believed that the earlier varieties will eventually become popular in Canada, for

home use especially. Two power spray pumps were purchased, one especially for spraying ornamental and shade trees. Three large sprayers each capable of throwing a spray for a radius of fifty feet were obtained and were of great value in keeping the lawns in fair condition during the great drought of 1914.

PUBLICATIONS.

During the past year, in addition to the Annual Report and the Summary of Horticultural Results there have been published by the Horticultural Division the following bulletins and pamphlets:

"The Planting and Care of Shade Trees," Bul. 19 S.S., by F. E. Buck, B.S.A.

"Renovation of the Neglected Orchard," Bul. 79, by M. B. Davis, B.S.A.

"How to Protect Fruits, Vegetables and Ornamental Plants from Insects and Fungous Diseases," Pam. 12, by W. T. Macoun.

"The Home Vegetable Garden and a Patriotic Gardening Competition," Pam. 13, by W. T. Macoun.

"Growing Grapes for Home Use," Exhibition Circular No. 11, by W. T. Macoun.

"Top-Grafting," Exhibition Circular No. 15, by W. T. Macoun.

"How to make and use Hot beds and Cold Frames," Exhibition Circular No. 16, by W. T. Macoun.

"Protection of Fruit Trees from Mice and Rabbits and Care of Injured Trees," Exhibition Circular No. 17, by W. T. Macoun.

The following contributions were made to the *Agricultural Gazette of Canada* during the year:—

April, 1914.—"Experiments with Varieties of Apples," by W. T. Macoun.

October, 1914.—"Ornamental Gardening at the Dominion Experimental Farms and Stations," by W. T. Macoun.

January, 1915.—"Fire Pots as Protection Against Frost," by M. B. Davis, B.S.A.

February, 1915.—"The Propagation of Ornamental Plants suitable for School Surroundings," by F. E. Buck, B.S.A.

March, 1915.—"Fruit Culture at the Experimental Farms," by W. T. Macoun.

And for the Agricultural War Book an article was contributed on "Growing Potatoes for Home and Market," by W. T. Macoun.

CORRESPONDENCE.

The correspondence of the Horticultural Division continues to grow rapidly. The depression in business would seem to have turned the attention of Canadians more to home life, and there are many inquiries for information in regard to the growing of vegetables and the beautifying of homes especially. So great has been the demand for bulletins that several have been exhausted and new editions have either been published or are under way. During the fiscal year 1914-15 there were 7,586 letters received and 7,979 despatched, which is more than a thousand increase in those received and those sent out over last year.

OTTAWA.

DONATIONS.

There are some donations received by the Horticultural Division every year, and it is a pleasure to be able to make public acknowledgment of these in the annual report. Following are those which were received in 1914:—

FRUITS.

Sender.	*Donation.*
Alexander, Mr. Ottawa, Ont.	Plants of Kentish filberts.
Bradt, E. P., Morrisburg, Ont.	Scions of Seedling apple.
Camp, Chas. B., Cheney, Neb.	Cuttings of Ernest, Santa Ana, Crecius, Canopus, Golden, Majestic, Delight, Guigon and Aurora grapes.
Chabot, Bernard, St. Laurent, Que.	Twenty-five strawberry plants from the Island of Orleans, Que.
Easton, W., Cobble Hill, B.C.	Apple Scions, probably of a seedling.
Fairfield, F. S., Orono, Ont.	Trees of New Spy seedling, Moses Sarky, and Colour Read hardy apples.
Hammond, Wallace, Carleton Place, Ont.	Cuttings of wild grape.
Loomer, E. I., Kingsport, N.S.	Scions of "Loomer" seedling apple.
Newman, C. P., Lachine Locks, Que.	Raspberry seedlings, plants.
Niemetz, V. P., Charkhow, Russia	Apple, plum, pear and cherry Scions.
Peters, S. C., Queenstown, N.B.	Scions of seedling apple.
Tait, D., Iron Bridge, Ont.	Omaha plum and Baltet pear Scions.

VEGETABLES.

Bicroft, G. W., London, Ont.	Seed of Byron Pink tomato.
Burpee, J. Atlee, Philadelphia, Pa.	Vegetable seeds.
Fairfield, F. S., Orono, Ont.	Aroostook Wonder potatoes.
Gellatly, D., Gellatly, B.C.	Seed of Earliest on Earth tomato.
Grace, Mrs. E., Strassburg, Sask.	Dalmeny Radium potato.
Whale, J. B., London, Ont.	Dooley potato.

ORNAMENTAL PLANTS.

Burpee, J. Atlee, Philadelphia, Pa.	Flower seeds.
Hill, D., Dundee, Ill.	White Pine seedlings.
Jackson, H. F., Argyle ave., Westmount, Que.	Shrub seeds.
Matthews, Mr., Allan Gardens, Toronto, Ont.	Seedling Chrysanthemums.
Osler, Sir E., Toronto, Ont.	Chrysanthemum cuttings.
Toronto Parks Board, Toronto, Ont.	Plants of Double White Petunia.
Morris, Frank, Norwood Grove, Man.	Plant of White *Anemone Nuttalliana*.
Thomann & Son, Jacob, Rochester, N.Y.	Rochester White Gladioli.

PLANT BREEDING.

Bass, G., Otter City, Kansas	Corn.
Horticultural Experimental Station, Vineland, Ont.	Pear Pollen.
Howitt, H. M., Prince Rupert, B.C.	Wild strawberry plants.
McLeod, D. P., Gould Station, Que.	Peas.
Ross, W. K., Scotsburn Station, N.S.	Corn.
Tomlinson, A. H., Prince Rupert, B.C.	Wild strawberry plants from the Atlin District and Queen Charlotte Island, B.C.
Turney, A. G., Fredericton, N.B.	Wild strawberry plants.

STAFF OF THE HORTICULTURAL DIVISION.

W. T. Macoun, Dominion Horticulturist.
M. B. Davis, B.S.A., Assistant in Pomology.
F. E. Buck, B.S.A., Assistant in Ornamental Gardening.
A. J. Logsdail, B.S.A, Assistant in Plant Breeding.
C. F. W. Dreher, B.S.A., Assistant in Vegetable Gardening.
M. D. MacCallum, Secretary.

OTTAWA.

H. Holz, Foreman of the Division.
J. McKee, Foreman in charge of Greenhouses.
H. J. Read, Foreman in charge of Records.
W. T. Ellis, Records' Clerk.
John Melvin, Foreman in Orchards.
Howard Russell, Foreman in Orchards.
J. Taggart, Foreman on Ornamental Grounds.
F. Taggart, Foreman on Ornamental Grounds.
Geo. Perrin, Assistant Foreman in Greenhouses.
G. E. Bass, Stenographer.
Miss Bertha Shields, Stenographer.

ACKNOWLEDGMENTS.

There has been marked progress during the past year in the Horticultural Division and this has been possible only through the hearty co-operation of those associated with me in the work. Mr. M. B. Davis, B.S.A., Assistant in Pomology, has done good work during the year, and the experiments with fruits have developed considerably since he took charge. During my absence from home he has performed the administrative work of the Division satisfactorily and since November, 1914, has had temporary charge of the Vegetable Gardening, Mr. Dreher having enlisted for service. The Ornamental Gardening continues to develop under Mr. F. E. Buck, B.S.A., and many new and interesting plants are being tested and cultural experiments tried under his direction. The Plant Breeding was continued by Mr. A. J. Logsdail, B.S.A., who has some very promising and interesting new things as the result of his work. Mr. C. F. W. Dreher, B.S.A., Assistant in Vegetable Gardening, enlisted in November, 1914, after having carried on the experimental work during the growing season.

I desire to express my appreciation of the services of my secretary, Mr. M. D. MacCallum, who has performed his duties in a very satisfactory manner during the past year. As foreman of the Division, Mr. H. Holz continues to render valuable help in the outside work. The success of the new greenhouses during the past year is sufficient testimony of the skill of Mr. J. McKee, the foreman of them. With him is associated Mr. Geo. Perrin, who with his long experience in the old greenhouses, is of much assistance.

With the large number of farms and stations now in the Experimental Farm System the work of keeping a return of the horticultural plants and experiments on each is considerable. Mr. Horace Read is in charge of the Central Card Record System and has again done his work satisfactorily. He is ably assisted by Mr. W. T. Ellis. I desire also to express my appreciation of the work of Messrs. John Melvin and Howard Russell, Foremen in the Orchards, and J. Taggart and F. Taggart, Foremen on the ornamental grounds. With the rapidly increasing correspondence and other work of the central office it is important to have efficient office assistance, and I have pleasure in acknowledging the satisfactory work of Mr. G. E. Bass and Miss Bertha Shields, stenographers. I wish to thank the other men in the Horticultural Division at Ottawa for the work they have cheerfully performed.

I desire again to acknowledge my indebtedness to the Superintendents of the Branch Farms and Stations for their hearty co-operation in developing the horticultural work.

I have the honour to be, sir,
Your obedient servant,

W. T. MACOUN,
Dominion Horticulturist.

OTTAWA.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

CHARACTER OF SEASON.

During the past seventeen years a record has been kept of the date when the frost was out of the ground in parts of the Horticultural Division. In 1914 the date was April 13. The average date for the seventeen years is April 12.

While it was showery during the month of April, 1914, the showers were so light that they did not amount to much. It was a cool month on the whole. The highest temperature was 70° F. on the 19th, but it was warm for only a few days. On the 13th the lowest temperature, which was 13° F., was recorded. May was a warm, dry month. The last spring frost recorded was on the 2nd, when the temperature was 31·2° F. This is much earlier than usual for the last frost. The highest temperature was 92·8° F. on the 27th. This was also the highest temperature for the whole summer. It was warm from the 18th to the 31st. During the month the temperature was over 80° F. on nine days; the nights, however, were cool. Only 0·30 inch of rain fell during May. Owing to this long spell of dry weather the first vegetable seeds sown would not in many cases germinate and a second sowing had to be made. By the end of the month the grass on the lawns was burned in places, which is very unusual for May. June was a moderately warm month, the highest temperature being 91° F. on the 24th. It was 82° and over on eight days, but they were the only really warm days of the month. The drought continued until June 18, when about one-third of an inch of rain fell, doing much good. Previous to this things were suffering badly. The strawberries were kept from drying up by drenching them with water by means of the power sprayers. On the 24th there was another good rain, which came just in time, as things were suffering again.

July was a warm month with little rain. It was 80° F. and over on nineteen days and 90° and over on four consecutive days. The highest temperature was 92° F. on the 17th. There was so little rain during the month that vegetables continued to suffer. A good rain on August 2 helped matters very much, but August was a dry month also. It was only moderately warm in August, though it was over 80° on nine days. The highest temperature was 90° on the 10th. It was warm to moderately warm during September, except the last week, which was cool. The temperature was 80° and over on seven days. The highest temperature was 92° on the 22nd. On the 26th there was a light frost in low spots which killed tomato and squash foliage. The first autumn frost recorded by the official thermometer was on the 29th, when the temperature was 30° F. Potatoes were badly injured and dahlias, cannas and other tender things were considerably hurt. While September was rather dry, vegetable crops improved very much during this month, potatoes doing particularly well.

It may be well to record here the precipitation during the six growing months of 1914, as it was the lowest in twenty-five years: April, 2·47 inches; May, 0·30 inch; June, 2·21 inches; July, 1·41 inches; August, 2·38 inches; September, 2·09 inches. Total, April to September, 10·86 inches.

October was moderately warm during the first half of the month and cool in the latter part. The highest temperature was 77° F. on the 4th and the lowest 22° on the 27th. The first frost of the month was on the 14th, when the temperature was 29·4°. This injured many of the flowers, but up to this time there had been a good show. There was no severe frost until the 25th when it was 27·6°, the frost killing practically

all the flowers. Up to this time the hardy annuals made a fair show. The weather was mild for the greater part of November. The lowest temperature was 2·2° below zero on the 18th, the only day it was below zero during the month. The temperature rose above freezing on twenty-three days. There was a heavy fall of snow on the 17th, and winter may be said to have set in on that date, though the snow was gone again on December 1, and the ground did not freeze up until December 4. The first two weeks of December were comparatively mild, the temperature rising above freezing on seven days. The remainder of the month was moderately cold with the coldest day on the 26th, when the temperature was 25° F. below zero. It was below zero on nine days during the month. There were about 9 inches of snow on the ground at the end of the month.

January was only moderately cold. The lowest temperature was 25·4° below zero on the 30th, which was the coldest day of winter. It was below zero on nine days during the month. February was moderately cold to mild with the temperature above freezing on 13 days. The lowest temperature was 10·5° below zero on the 4th, and it was only five times below zero during the month. As in previous months this winter there was very little precipitation, and by February 24, owing to mild weather the ground was bare in places, but up to this time since the middle of December the ground had been covered with snow. Owing to the scarcity of snow this winter the loss in the rose garden is sure to be very great as many of the bushes have not been completely covered with snow all winter.

The month of March was mild, the temperature being above freezing on twenty-three days. The highest temperature was 45·6° on the 24th, and the lowest 3° on the 3rd. It was not once below zero during the month. By the end of the month the ground was practically bare The past winter has been a relatively mild one and on only two occasions was it as low as 20° below zero. There was very little snow, and the greatest depth at any time would be about 18 inches. The past year has been by far the driest during the past twenty-five years, there being more than 10 inches less precipitation than the average.

FRUIT AND VEGETABLE CROPS.

The apple crop of Canada was a disappointing one on the whole in 1914, although the crop was a medium to good one. Owing to the outbreak of the war making prospects of sales uncertain, there were few buyers at first, with the result that the price of fruit was very low, and much was left to rot in the orchards. Those who picked and stored their apples, however, were well repaid for doing so as the price steadily advanced after the picking season was over. The pear crop was light in Ontario, medium in Nova Scotia and good in British Columbia. There was considerable winter killing of the trees of this fruit in the colder parts of Ontario, as of plums also. The plum crop was light, except in British Columbia, where it was good. Where the native varieties are grown in the East there was a fair crop.

The peach crop was practically a total failure in the province of Ontario, owing to winter injury to the flower buds. The only place where there was any appreciable quantity to harvest was on the Essex peninsula.

There was a light crop of sweet cherries in Ontario, but a good crop of sour cherries in the districts where these are grown commercially. In Eastern Ontario the cherry crop was a failure. In British Columbia the crop was a medium one, and a good one in Nova Scotia.

There was a full crop of grapes, as is usual with this fruit.

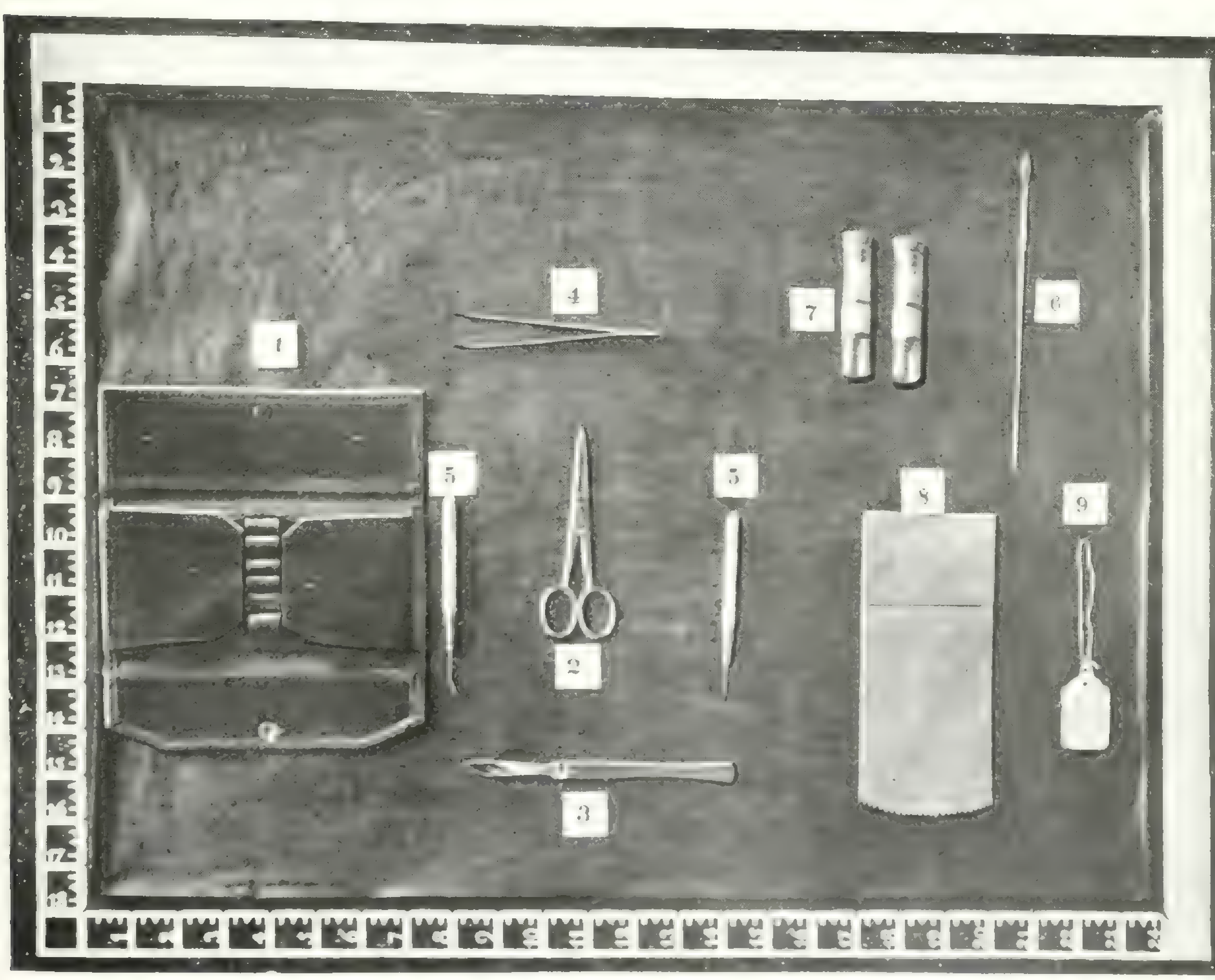
The strawberry crop was below the average in Eastern Canada owing to the drought of 1913, to winter injury, spring frosts, and, in cases, to the drought of 1914. In British Columbia the crop was good.

OTTAWA.

Central Farm. Range of greenhouses.

Dwarf or Cordon Apple Tree with blossoms enclosed in paper bags for crossing purposes. This dwarf type of tree is particularly suitable for hybridizing work under glass.

Apple tree with cluster of flowers enclosed in Manila-paper bags for crossing purposes. The flowers thus enclosed in bags are protected from indiscriminate pollination by insects.

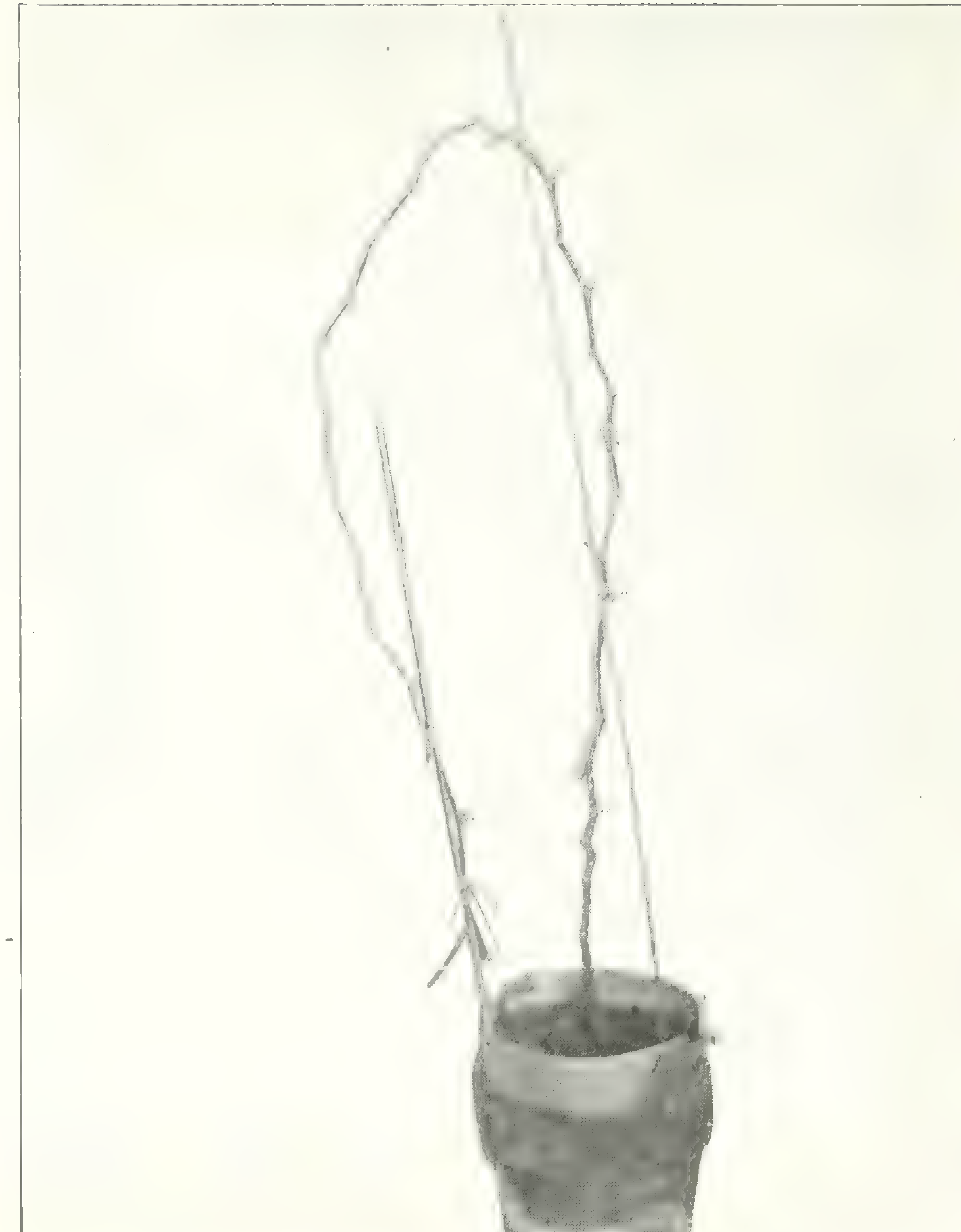


Set of instruments and accessories for plant-breeding work.

1. Case for instruments. 2. Scissors, narrow-bladed. 3. Scalpel. 4. Tweezers. 5. Needle holders with needles. 6. Camel's hair brush. 7. Small glass bottles. 8. Manila paper bags. 9. Tags, with cord attached.

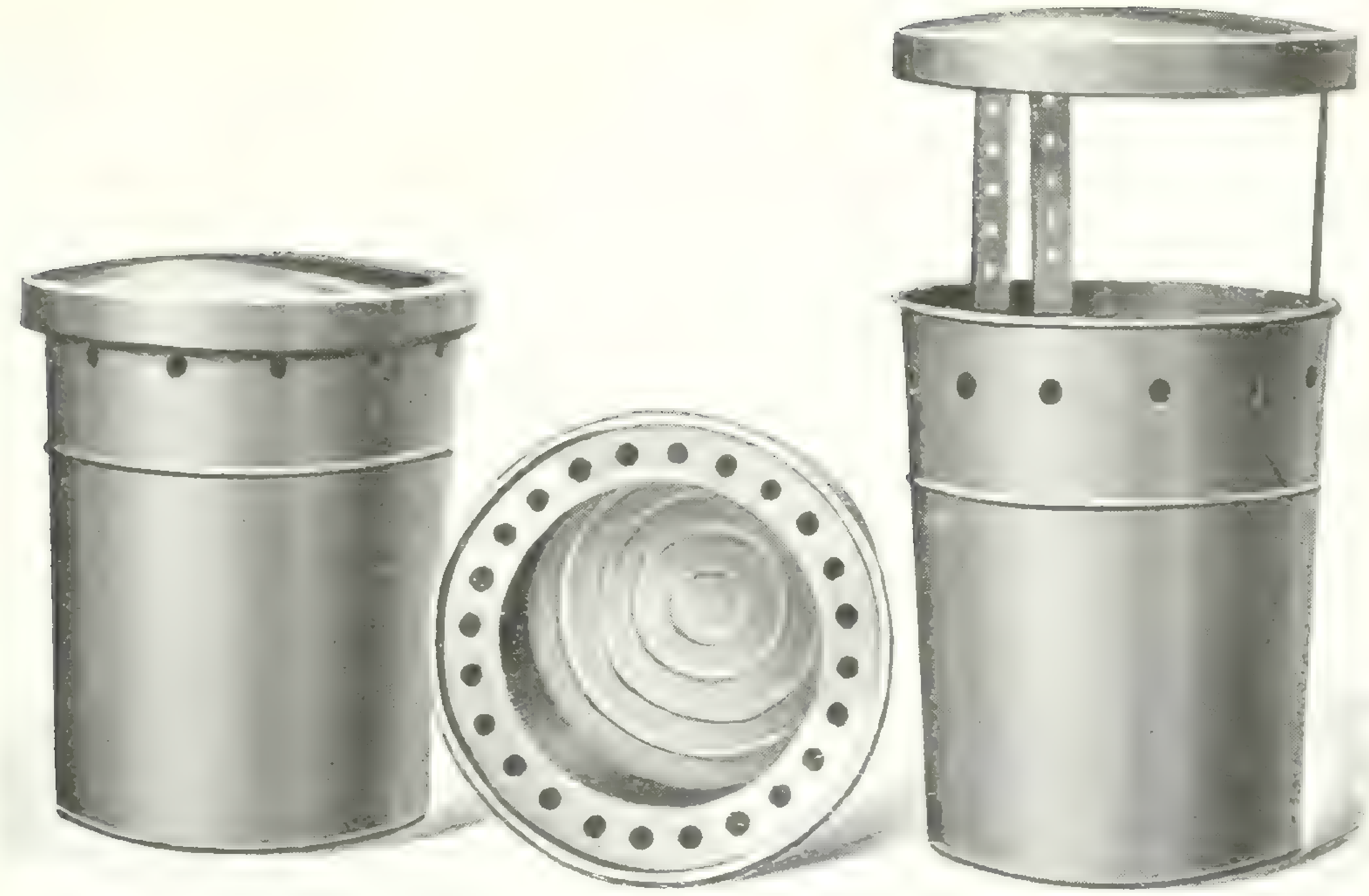
Central Farm. Grapes in pots.

Central Farm. Unpruned grape vine in pot.



Central Farm. Pruned grape vine in pot.

Central Farm. Rose pergola.



Central Farm. Orchard heater.

Hardy perennials: Paeonies at Charlottetown, P.E.I., 1914.

Bed of Asters, Brandon Experimental Farm.

While the early part of the season was unfavourable to vegetables, there was a good crop of most kinds of these. The potato crop was particularly good in Eastern Canada, but owing to the long continued drought in the prairie provinces the crop was light there. In British Columbia there was a good crop.

The tent caterpillars were not so injurious in Ontario and Quebec as in 1913, but were bad enough in some places. Apple Scab was not as troublesome as in some seasons.

At the Central Farm at Ottawa the very severe drought affected the fruit and vegetable crops adversely in the early part of the season, especially, but they recovered to a large extent. The months of April, May, and part of June were very dry. Vegetable seed had in some cases to be sown twice as seed of the first sowing came up so unevenly. There was a heavy drop of apples in June but a sufficient number remained on the trees to develop into a good crop of fruit practically free from disease and insect injuries. The strawberry crop, which promised very well before being affected by the drought, would have been almost a total failure if it had not been for the water applied by means of power sprayers, which kept the fruit from drying up until rain, coming on June 18 and 24, improved matters very much, resulting in one of the best crops ever obtained at the Farm.

Vegetables were a fair crop on the whole, and potatoes, which were badly affected by the drought in the early part of the season, recovered and produced a good crop.

SEEDLING FRUITS SENT TO THE HORTICULTURAL DIVISION FOR EXAMINATION, 1914-15.

There were some seedling fruits sent in for examination as usual in 1914. Partial descriptions are taken of those not considered promising and of those which are of considerable merit or are thought worthy of further test a more detailed description is made and scions are asked for of the best.

Record Number—

615 seedling apples from L. D. Robinson, Bridgewater, N.S.
616 " Rev. R. McEwen, Antigonish, N.S.
617 " No. 1, 2 & 3 from H. W. Roberts, Clarendon Station, N.B.
618 " from H. W. Rogers, Northampton, N.B.
619 " F. R. Taylor, Cobden, Ont.
620 " Rev. J. L. Francoeur, Casselman, Ont.
621-623 " No. 1, 2, 3, from C. L. Stephens, Orillia, Ont.
624 " from E. P. Bradt, Morrisburg, Ont.
625 " J. A. Macadam, Vankleek Hill, Ont.
626 " W. H. Reid, Waterdown, Ont.
627 " J. F. Graham, Markdale, Ont.
628 " Mr. Armstrong (per F. H. Grindley), Ottawa South, Ont.
629 " C. A. Cass, L'Orignal, Ont. (See description.)
630 " A. A. Knight, Lindsay, Ont. (See description.)
631 " W. L. Scott, Ottawa, Ont. (See description.)
632 " Mr. Swerdfeger (per E. P. Bradt, Morrisburg), near Morrisburg, Ont. (See description.)
633 " T. Rowan (4 seedlings) McGregor, Man.
634 seedling plum "Paxton No. 1" from F. P. Robson, Echo Drive, Ottawa, Ont. (See description.)
635 seedling red currant from O. Masser, Drayton, Ont. (See description.)

Apple Seedling from C. A. Cass, L'Orignal, Ont.—Medium size; form, oblate to roundish; cavity, deep open; stem, short, stout; basin, deep, open, wrinkled; calyx, closed or partly open; colour, pale yellow well washed with bright crimson; seeds, medium size, acute; dots, few, white, indistinct; skin, moderately thick, tender; flesh, white tinged with red; core, medium; flavour crisp, juicy, subacid, pleasant; quality, good; season, September. Tree thought to be a seedling. Between three and four barrels taken from it. General notes, very handsome, promising, probably a Fameuse seedling.

Apple Seedling from A. A. Knight, Lindsay, Ont.—Fruit, large; form, roundish conical, very symmetrical; cavity, deep, open; stem, very short, stout; basin, deep, open, nearly smooth; calyx, open; colour, greenish yellow thinly washed with crimson; seeds, above medium, acute; dots, few, indistinct; skin, thick, tough; flesh, dull white, tender, moderately juicy, rather coarse; core, medium size, open; flavour, subacid, pleasant; quality, above medium to good; season, probably late November to February. A handsome apple and worthy of further test.

Apple Seedling from W. L. Scott, Ottawa, Ont.—Size, above medium; form, roundish to oblate conic; cavity, deep, open; stem, medium length, moderately stout; basin, open, shallow, wrinkled; calyx, closed; colour, pale greenish-yellow thinly washed and splashed and streaked with bright red; seeds, medium size, acute; dots, obscure; skin, moderately thick, tender; flesh, dull white, crisp, juicy, rather coarse; core, medium size, open; flavour, subacid, pleasant; quality, good; season, evidently September. Has an aroma. Not quite enough red on it to make it very attractive and a little coarse in the flesh, but a nice eating apple.

Apple Seedling (Seedless) from Mr. Swerdfeger, near Morrisburg, Ont.—Size, medium; form, roundish; cavity, shallow, open; stem, short, moderately stout; basin, medium depth and width, nearly smooth; calyx, open; colour, yellow, thinly washed and splashed with orange red. No seeds in two specimens received; dots, few, russet flecks; skin, medium; flesh, yellow, tender, moderately juicy; core, medium size, little cartilaginous matter; subacid, little flavour; quality, medium; season, evidently October. Neither attractive nor good in quality, but interesting because seedless.

Seedling Plum called "Paxton No. 1" from F. P. Robson, Echo Drive, Ottawa, Ont.—Size, above medium; form, roundish; cavity, narrow, shallow; stem, none sent; suture, a distinct line, not depressed; apex, rounded; colour, yellow practically entirely overspread with deep red; dots, obscure; skin, thin, moderately tough; flesh, yellow, juicy; flavour, sweet, no astringency; quality, good; stone, above medium, flattened, cling; season, mid to late September. General notes, much like Cheney in appearance, but seems better in quality than Cheney; a good plum.

Seedling Red Currant received from O. Masser, Drayton, Ont.—Length of bunch, 3 inches; size of fruit, very large; colour, bright, brilliant crimson; bloom, very lustrous; skin, rather thick; flavour, slightly subacid, very little acidity; quality, good; general notes, a very large and handsome currant of good quality.

APPLES ORIGINATED IN THE HORTICULTURAL DIVISION.

SEEDLING VARIETIES.

Most of the apples originated in the Horticultural Division, described in previous reports, have grown on trees raised from seed of certain varieties of apples which were naturally or open pollinated in an orchard containing many varieties. A large number of excellent sorts have fruited, of which one hundred have now been named. Of these, nine new ones are described below. These are being tested at the different Branch Farms and Stations throughout Canada where the poorest will be gradually eliminated so that in time it will be known which, if any, are better than the varieties at present on the market. It is believed that some of these seedlings are better.

Drumbo (Winter St. Lawrence Seedling).—Fruit, above medium to large in size; form, conical; cavity, deep, medium width, russeted; stem, short, stout; basin, deep, medium width, slightly wrinkled; calyx, open or partly open; colour, pale yellow well washed and splashed with dark crimson; seeds, medium size, acute; dots, few, grey, conspicuous; skin, thick, moderately tender; flesh, white, rather coarse, tender, juicy;

core, medium; flavour, subacid, pleasant; quality, good; season, late November to February or later. Resembles Winter St. Lawrence very much in outward appearance, flesh and flavour. Evidently a better keeper than Winter St. Lawrence.

Emilia (Northern Spy Seedling).—Fruit, medium size; form, roundish conical; cavity, deep, medium width; stem, short, stout; basin, deep, medium width, wrinkled; calyx, partly open; colour, greenish yellow washed and splashed with crimson; seeds, medium size, acute; dots, moderately numerous, white, distinct; skin, thick, moderately tender; flesh, dull white, crisp, juicy, tender; core, medium size; flavour, briskly subacid, pleasant; quality, good to very good; season, December probably to April. Resembles Northern Spy in colour, shape, flesh and flavour. Very much like Northern Spy.

Forerunner (McIntosh Seedling).—Fruit, medium size; form, roundish ribbed; cavity, deep, medium width; stem, medium to long, stout; basin, medium width, shallow to medium, wrinkled; calyx, closed or partly open; colour, yellow well washed with rich orange red and crimson; seeds, medium size, obtuse; dots, few, small, yellow, indistinct; bloom, very thin, pinkish; skin, moderately thick, moderately tough; flesh, yellowish with red near basin, tender, moderately juicy; core, medium, open; flavour, subacid, little flavour; quality, above medium; season, mid August to late September. Does not resemble McIntosh except in being highly perfumed.

Galton (*Northern Spy Seedling*).—Fruit, medium size to above; form, roundish, slightly ribbed; cavity, deep, medium width; stem, medium length, slender; basin, deep, medium width, almost smooth; calyx, closed; dots, few, white, distinct; bloom, bluish; colour, yellow well washed with deep orange red approaching crimson; predominant colour, deep orange red; flesh, yellowish with traces of red near basin, crisp, tender, juicy; core, medium size, open; seeds, medium size, obtuse; skin, moderately thick, tough; flavour, subacid, spicey, pleasant; quality, good; season, late September probably to November. Flavour somewhat like Sops of Wine, no marked resemblance to Northern Spy. Colour somewhat like Sops of Wine.

Linda (*Langford Beauty Seedling*).—Fruit, above medium to large size; form, roundish to oblate; cavity, medium width, shallow to medium; stem, short, stout; basin, medium depth, open, wrinkled; calyx, partly open; colour, pale yellow washed and splashed with crimson; seeds, large, acuminate; dots, few, yellow, distinct; bloom, pinkish, thin; skin, moderately thick, moderately tough; flesh, juicy; briskly subacid, aromatic; quality, good; season, November probably to February. Resembles Langford Beauty considerably in outward appearance and in flavour. An attractive looking apple.

Lipton (*Northern Spy Seedling*).—Fruit, medium size; form, roundish conical, ribbed; cavity, deep, open; stem, short, stout; basin, deep, medium width, wrinkled; calyx, open; colour, yellow washed and splashed with crimson; seeds, medium size, acute; dots, moderately numerous, yellow distinct; skin, moderately thick, moderately tender; flesh, yellow with traces of red, crisp, tender, juicy; core, medium; flavour, subacid, pleasant; quality, good; season, November probably to February. Colour and shape, flesh and flavour much like Northern Spy.

Marne (*Northern Spy Seedling*).—Fruit, above medium to large in size; form, oblate, slightly ribbed; cavity, deep, open, russeted; stem, short, stout; basin, deep, open, nearly smooth; calyx, open; colour, yellow thinly washed and splashed with crimson; seeds, medium size, obtuse; dots, few, white, distinct; skin, thick, moderately tough; flavour, subacid, pleasant; core, medium; flesh, yellowish, crisp, tender; juicy; quality, good; season, November probably to February. Resembles Northern Spy somewhat in character of flesh and flavour.

Nome (Swayzie Seedling).—Fruit, medium size, form, oblate to roundish; cavity, open, deep, russeted; stem, short, stout; basin, open, medium depth to shallow, smooth; calyx, open; colour, yellow washed with orange red; seeds, large, obtuse; dots, obscure; skin, moderately thick, tender; flesh, yellow, tender, moderately juicy, breaking, buttery; core, small; flavour, subacid, pleasant, high, spicey; quality, good to very good; season, October and November. Does not resemble Swayzie except in having high, spicey, flavour. Resembles Blenheim somewhat in outward appearance.

Winton (McIntosh Seedling).—Fruit, medium size; form, roundish conical; cavity, narrow, medium depth, russeted; stem, medium to long, moderately stout to stout; basin, medium depth and width, nearly smooth; calyx, open; colour, pale yellow well washed with crimson and orange; dots, moderately numerous, yellow; seeds, medium size, obtuse or acute; skin, grey, distinct, thick, tough; flesh, white, tinged with red sometimes, tender, juicy; core, medium size, open; flavour, subacid, good, McIntosh-like; quality good; season, late September, October. Does not resemble McIntosh in outward appearance, but flesh and flavour much like McIntosh. Distinctly of Fameuse group. Has perfume like the McIntosh. Attractive in appearance.

CROSS-BRED VARIETIES.

The only distinction between "Seedlings" and "Cross-bred" varieties as dealt with here is that in the latter case the varieties have been originated by artificial pollination, both parents being known.

While the writer has not done any cross-breeding of apples during the past few years, that work now being done by Mr. A. J. Logsdail, B.S.A., assistant in charge of the Plant Breeding in the Horticultural Division, only a small proportion of the trees resulting from the work, begun by the writer in 1899, have as yet fruited, hence for several years yet these crosses will be reported upon by him. There is also the report on the work done in cross-breeding by the late Dr. Wm. Saunders, which the writer hopes to complete in future reports.

McIntosh-Lawver Crosses.—For several seasons the writer used as parents in crossing, the McIntosh and Lawver apples, reciprocal crosses being made. These parents were used because it was desired to get a longer keeping, hardy, red apple of good quality and these parents between them seemed to have all the characteristics desired. The McIntosh is a hardy red apple of very good quality but does not keep long enough. The Lawver is a red apple, only above medium in quality, and when the crossing was made, was thought to be sufficiently hardy for the purpose but since then it has not proven hardy, and a number of the crosses have proven too tender.

As descriptions have now been made of 16 varieties from this cross it seems desirable to publish the results. Of these, 10 are crosses with Lawver as the female parent and 6 with McIntosh as the female parent.

Characteristics of the fruit of sixteen varieties of apples, crosses between McIntosh and Lawver:—

	Lawver female x McIntosh male (10 crosses.) Per Cent.	McIntosh female x Lawver male (6 crosses.) Per Cent.
Size		
Small	0	0
Below medium	10	16·7
Medium	60	50
Above medium	30	33·3
Large	0	0
	100	100

McIntosh is above medium in size and Lawver is rather uneven in size varying from medium to above medium.

Form		
Oblate	30	0
Roundish conical or roundish	70	100
Conical	0	0
Oblong	0	0
	100	100

McIntosh is roundish while Lawver is roundish to oblate.

Colour		
Green or yellow predominating	10	0
Red or crimson	50	100
Pinkish red	20	0
Orange and orange red	20	0
	100	100
Cavity		
Small	0	33·4
Medium	70	33·3
Large	30	33·3
	100	100

McIntosh has a medium cavity; that of Lawver is rather small.

Stem		
Short	30	0
Medium	60	100
Long	10	0
	100	100

McIntosh has a short stem; Lawver has a long one.

Basin		
Small	0	0
Medium	100	66·7
Large	0	33·3
	100	100

Both McIntosh and Lawver have small basins.

Calyx		
Open	80	100
Closed	20	0
	100	100

McIntosh has a closed or partly open calyx; that of Lawver is closed.

NOTE.—Apples under 1½ inches in diameter are very small; between 1½ and 2¼ inches, small; 2¼ to 2½ below medium; 2½ to 2¾ inches, medium; 2¾ to 3 inches, above medium; 3 to 3½ inches, large; above 3½ inches, very large.

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Seeds	Lawver female x McIntosh male (10 crosses.) Per Cent.	McIntosh Female x Lawver male (6 crosses.) Per Cent.
Small	0	0
Medium	60	33·3
Large	40	66·7
	100	100

McIntosh has medium sized seeds. Lawver has large seeds.

Dots		
Distinct	40	66·7
Indistinct	60	33·3
	100	100

McIntosh and Lawver both have distinct dots.

Skin		
Thin	0	0
Medium	80	66·7
Thick	20	33·3
	100	100

Both McIntosh and Lawver have thick skins

Skin		
Tender	50	83·3
Medium	20	16·7
Tough	30	0
	100	100

Both McIntosh and Lawver have tough skins.

Flesh		
Juicy	50	66·7
Moderately Juicy	50	33·3
	100	100

Both McIntosh and Lawver have juicy flesh.

Core		
Small	40	16·7
Medium	60	83·3
Large	0	0
	100	100

McIntosh has a medium and Lawver a small core.

Core		
Closed	40	66·7
Open	60	33·3
	100	100

McIntosh has an open and Lawver a closed core.

Flavour		
Sweet	10	0
Mildly subacid	10	16·7
Subacid	70	83·3
Briskly subacid	10	0
Acid	0	0
	100	100

Both McIntosh and Lawver are subacid.

OTTAWA.

Size.	Lawver female x McIntosh male (10 crosses.) Per Cent.	McIntosh Female x Lawver male (6 crosses.) Per Cent.
Medium	0	16·7
Above medium	50	66·7
Good to very good	50	16·6
	100	100

McIntosh is very good in quality. Lawver is above medium in quality.

Season		
August to mid September	0	0
Mid September to mid October	0	0
October to November	10	0
November to February	40	50
December to April	50	50
	100	100

The season of McIntosh is November to February and later, and of Lawver December to April and later.

General Resemblance or Blend of Characteristics.—In six out of ten of the crosses with Lawver as the female, no marked resemblance to either parent is recorded, and in three of the six with McIntosh as the female. Of the four varieties with Lawver as the female parent that have marked characteristics of the parent, two have distinct McIntosh flavour and two resemble McIntosh in colour. The Lawver characteristics are not very marked.

Of the six varieties with McIntosh as the female parent only two show marked resemblance to either parent in the important characteristics of colour, flesh and flavour, although in season there is a large proportion that resembles both parents. One resembles McIntosh considerably in shape, colour, and flesh, and bears some resemblance to Lawver in outward appearance. The other resembles McIntosh somewhat in flesh and flavour and Lawver somewhat in shape.

The McIntosh seedlings from open pollination have given a larger proportion with marked McIntosh characteristics than has been the case in this cross. While there are no varieties which have yet fruited which are as good as McIntosh in quality, ten of the sixteen are better than Lawver in quality, and thirteen of the sixteen are later in season than McIntosh, and most of the varieties are of high colour and attractive in appearance like the parents. Four varieties of this cross have been named, Holz and Vermac with Lawver as female parent, and Rustler and Mavis with McIntosh as female parent. The descriptions of the first three will be found in the reports for 1912 and 1913. The description of Mavis follows:—

Mavis (*McIntosh female* x *Lawver male*).—Fruit, medium to above medium in size; form, roundish, slightly ribbed; cavity, open, medium depth to shallow; stem, medium length, moderately stout to stout; basin, deep, medium width, wrinkled; calyx, open; colour, yellow washed and splashed with crimson; seeds, medium plump, obtuse; dots, obscure; bloom, light; skin, thick, tough; flesh, yellowish, crisp, tender, juicy; core, medium, open; flavour, subacid, pleasant, sprightly; quality, above medium to good; season, mid-November probably to March. Does not resemble either McIntosh or Lawver very much.

OTHER CROSSES.

Lawver x *Fameuse.*—Fruits from four trees of this cross have been described. The season of all of these is later than Fameuse. Three of them are good in quality or better than Lawver. There is no marked resemblance to Fameuse in any of them.

OTTAWA.

Fameuse x *Lawver*.—Fruit from one tree has been described. The quality is good and the season January to late winter. Resembles Lawver somewhat in outward appearance and character of flesh. No marked resemblance to Fameuse.

Milwaukee x *McIntosh*.—Fruits from four trees have been described. One resembles Milwaukee very much in shape, colour, flesh and flavour. No marked resemblance to McIntosh in any of them. Quality is medium in one case and above medium in three cases. The season of three is from December to late winter and of the other November to January.

McIntosh x *Milwaukee*.—One was described. This resembles McIntosh in colour but not strikingly otherwise. No marked resemblance to Milwaukee except in shape. Season late, December to March.

Northern Spy x *Milwaukee*.—Five varieties were described. All of these show a blending of Northern Spy and Milwaukee, but none are good in quality, four being above medium and one only medium. The colour ranges from carmine to orange red. The season of four of them is from December to April, while one of them is from November to January. They have more Milwaukee than Northern Spy characteristics.

Lawver x *Northern Spy*.—One variety from this cross was described. It is above medium to good in quality and is a late keeping apple. The seeds are large as in Lawver, but there is no marked resemblance to either parent in other characteristics.

Northwestern Greening x *Northern Spy*.—One tree fruited. The season is late November to February; the quality above medium to good. The predominant colour is orange red. There is no marked resemblance to either parent except in being a late keeper.

Scott Winter x *McIntosh*.—One tree fruited. The fruit resembles Scott Winter in flesh and flavour, but apart from that there is no marked resemblance to either parent. Colour is pale yellow washed with bronze red on sunny side. Season, November; quality, above medium.

INDIVIDUALITY IN APPLE TREES.

In the annual report for 1903 and in several of the reports since, yields have been published from individual trees of the same varieties of apples planted at the same time and growing under apparently very similar conditions. It was shown that there was a great difference in the yields from different trees, some producing from two to three times as much as others. It was not known whether this difference in yield was due to a difference in the soil or whether, as some horticulturists believe, that each bud of an apple tree has an individuality of its own which is perpetuated by propagation. To determine, if possible, whether these differences would be continued in trees grafted from them, scions were taken from the least productive tree, the most productive tree and the tree which bore a good crop every year in a row of eighteen Wealthy apple trees. These trees were propagated in 1905, being root grafted on seedlings of the Rose of Stanstead Crab and planted out in 1909 on a uniform piece of soil. They began bearing in 1912, and in the following table will be found the yields obtained for 1912, 1913, and 1914. It will be seen that trees propagated from the heaviest bearers have so far given the largest crops. The results are interesting and would appear to indicate that the yielding habit was perpetuated, though several years' more crops are necessary before one should draw any conclusions.

OTTAWA.

Yield of Heaviest Bearing Tree.

Record No.	Tree.	Yield 1912.	Yield 1913.	Yield 1914.
6320	3/1	¼ gallon.	0	4 gals.
6321	3/2	0	0	7 "
6322	3/3	0	0	4 "
6323	3/4	0	0	4 "
6324	3/5	½ gallon.	2¾ gallons.	8 "
6491	13/3	½ "	1 apple.	7·5 "
6475	12/4	1 "	¼ gallon.	4 "
Total yield	....	2¼ gallons.	3 gallons.	38½ gallons.

Yield of Heaviest and Regular Bearing Tree.

Record No.	Tree.	Yield 1912.	Yield 1913.	Yield 1914.
6354	5/1	2 apples.	3¼ gallons.	3 gallons.
6355	5/2	3 "	2 apples.	7 "
6356	5/3	0	0	3 "
6357	5/4	0	0	3 "
6358	5/5	½ gallon.	2¾ gallons.	10 "
6476	12/5	0	1¾ "	5 "
6481	12/10	2 gallons.	10 "	9 "
Total yields	....	2½ gallons.	17¾ gallons.	40 gallons.

Yield from Least Productive Tree.

Record No.	Tree.	Yield 1912.	Yield 1913.	Yield 1914.
6337	4/1	0	¾ gallon.	3 gallons.
6338	4/2	0	0	5 "
6339	4/3	0	0	6 "
6340	4/4	0	0	3 "
6341	4/5	½ gallon.	¼ gallon.	5 "
6479	12/8	0	0	9 "
6490	13/2	0	0	4 apples.
Total yields	....	½ gallon.	1 gallon.	31¼ gallons.

Summary.	Total Yield in Gallons 1912-14.
7 trees propagated from heaviest yielding tree	43¾
7 trees propagated from heaviest and regular bearing tree	60½
7 trees propagated from least productive tree	32¾

When the scions from which trees were propagated were taken from the parent tree in 1905, the latter, which had been planted in 1896, had yielded 103¼ gallons, 88¼ gallons, and 39 gallons, respectively.

OTTAWA.

POMOLOGY.

(M. B. Davis, B.S.A., *Assistant in Charge.*)

The work in Pomology consists mainly, at present, of the testing of different varieties of tree fruits and small fruits. Coupled with this, experiments in spraying, pruning and frost protection have been conducted. The original arrangement of the orchards has rendered cultural work impossible to any extent.

The results of these tests have been reported on from time to time, and in this report will be found the results of the variety tests in currants and raspberries to date. This past season work in frost protection, thinning, and spraying were especially featured aside from the regular routine work necessary for the care of so many varieties of fruits. The results of these investigations will be found on the following pages.

NEW OR NOT WELL KNOWN VARIETIES OF APPLES.

Many new varieties of apples are growing in the orchards at the Central Experimental Farm, consisting of those originated there, of those which have been sent in from individuals throughout Canada, and of those which have been introduced through the trade. The tree of the Delicious apple, which has been much advertised and planted in the Central and Western States, kills back at Ottawa and is evidently not going to be hardy enough for commercial purposes here. The Red June apple, which is much grown in the Southeastern States as an early apple, is a handsome apple of good quality which has fruited for several seasons and is worthy of further test. The Crimson Beauty, a very handsome early variety originated in New Brunswick, has proved very profitable in the Maritime Provinces. It is one of the earliest apples grown, being well coloured early in August. It is, however, only of medium quality, which detracts from its value. The Stayman Winesap and Rome Beauty are two good winter varieties which fruited at Ottawa in 1914. The latter has fruited for several seasons and is proving hardier than at first anticipated, but further experience is required before recommending it for commercial planting where the climate is as cold as at Ottawa. Legal Tender, a new winter variety, fruited this year, but was found to be only medium in quality. The Evelyn, a winter seedling of Wealthy, also fruited but was found not sufficiently attractive in appearance nor good enough in quality. Mitchell Red Warrior is a handsome September apple, but not good enough in quality.

A WEALTHY APPLE ORCHARD CLOSELY PLANTED.

In 1896 a small orchard of Wealthy apples was planted at the Central Experimental Farm. This orchard contained 144 trees, 10 by 10 feet apart, or at the rate of 435 trees per acre.

The idea in connection with this orchard was to ascertain whether or not the close planting of such early bearing varieties as Wealthy was a profitable undertaking. As the trees have crowded each other they have been removed from time to time, and eventually a very large number will be removed until practically the whole orchard is demolished. It is considered that by planting such orchards as these, with the idea of tearing out the trees and replanting, a greater average profit per acre can be obtained than by placing the trees farther apart and waiting for some years for all the space to be utilized. This, of course, is only practicable with such varieties as the Wealthy, Wagener, and Duchess, and trees which are comparatively small-

growing trees and bear at a young age. In removing trees the poorer yielding ones have been removed as far as possible instead of the heavier yielding trees, a record having been kept of what each tree has produced since 1899. Of the original 144 trees there are now 88 left.

The treatment of this orchard is different from the general practice, as the orchard is left in sod and the grass kept cut and allowed to remain as a mulch. It is manured once in three years.

Following will be found a statement of yields, dates, expenses and profits from the time the orchard was planted until the end of 1914:—

WEALTHY ORCHARD, 1914.

	Gallons.
Fruit picked	1,043·5
Windfalls	867·0
Total	1,910·5

Sales of Fruit.		Estimates per acre.
40 baskets at ·20	$ 8 00	$ 25 62
145 " ·225	32 62	104 48
40 " ·25	10 00	32 03
181 " ·30	54 30	173 92
20 bags small apples at ·50	10 00	32 03
	$ 114 92	$ 368 08

Expenses, 1914.		Estimates per acre.
Mowing, 1 man 5 hours at ·20	$ 1 00	$ 3 20
Lime sulphur and poison, one spraying	1 75	5 61
Bordeaux and poison, 3 sprays	1 60	5 13
Spraying 4 times	3 20	10 25
Putting on tree protectors, 1 man, 4 hours, at ·20	0 80	2 56
Rent of land	0 94	3 01
406 baskets at 5 cents with covers	20 30	65 02
Commission on sales	11 50	36 83
Packing fruit 52 hours at ·20	10 40	33 31
Picking fruit 137 hours at ·20	27 40	87 76
Total expenses	78 89	252 68
Net profits	36 03	115 40
	$ 114 92	$ 368 08

WEALTHY ORCHARD 1896-1914.

Average net profit per acre from date of planting 1896-1914—

Net profits per acre 1896-1904	$ 487 13
" " 1905	103 13
" " 1906	112 80
" " 1907	37 54
" " 1908	104 34
" " 1909	108 98
" " 1910	105 47
" " 1911	49 38
" " 1912	399 44
" " 1913	95 64
" " 1914	115 40
Total net profits per acre 1896-1914, 19 years	$ 1,719 28
Average net profit per acre from date of planting 1896-1914	90 49
Average net profit per acre from date of fruiting, 1899-1914, 16 years	107 46
Average net profit per acre from date of planting 1896-1914	90 49
" " 15 years " "	70 63

OTTAWA.

AUTUMN-BEARING STRAWBERRIES.

A number of varieties of the autumn-bearing strawberries have been tested at Ottawa, but the best so far is the Progressive, which did very well in 1914, giving a fair crop of strawberries in the regular strawberry season and producing another fair crop in the autumn, the fruit continuing to ripen until injured by frost. The Progressive is an early ripening, attractive looking variety of medium size and good quality and has an advantage over some of the other autumn-bearing sorts in that it produces a moderate number of runners whereas most of the other sorts tested have made very few runners. Any one who desires to have strawberries in the autumn can do so by growing some of this or other varieties, but whether there will be much of a commercial demand for such fruit at a time of year when other fruits are so abundant is doubtful. On a small plot the Progressive yielded at the rate of 4,333·7 pounds per acre after July 22, when the regular strawberry season was over, and at the rate of 5,649·38 pounds up to the date of the last picking on September 25, or a total of 9,982·45 pounds per acre.

GROWING GRAPES UNDER GLASS IN POTS.

This past season witnessed the first attempt at this Farm to grow grapes under glass. As the greenhouse space available for horticultural purposes is insufficient to meet all the demands made upon it, it was considered advisable to try growing the grapes in pots instead of in a border. In this way the vines occupy the house only about eight or nine months of the year, leaving the house available the other three or four months for other crops.

The best European varieties of grapes were obtained and two-year fruiting canes were used. These were obtained from the nursery in 12-inch pots early in the fall of 1913, and stored in the cellar until March 1, 1914. At this date the vines were removed to the greenhouses, and for the first few weeks placed in any position that was vacant and not too hot.

As soon as the buds showed signs of swelling the vines were taken to the vinery and placed in their permanent position.

Two different methods of training were adopted: one in which the vines were trained to wires and led up the eaves of the house, and another in which they were simply coiled around bamboo stakes inserted in the pot. This latter system is especially adapted to cases where it may be desirable to move the pots from place to place during the fruiting season. The wire system, which is more permanent, is preferable, it giving the vines more light as they are spread out over a much larger surface.

From time to time during the summer the vines were fed with liquid manure, as constant feeding is necessary in pot culture, the amount of soil being so limited. Constant watering was found necessary as the pots dried out very quickly. In these respects it is a more expensive system than growing in the border.

After the removal of the fruit in early fall, the vines were removed to a sheltered position out of doors and allowed to ripen up their wood before removing to the winter quarters. Just before removing to the cellar the vines were pruned according to the spur system, which is simply one large leading cane with the laterals pruned back to a single bud each year. The accompanying illustrations show a vine before and after pruning.

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Following is a table of the varieties grown, together with the average weight of fruit taken from each vine, and also the largest yield from a single vine of each variety:—

Variety.	Average yield per Vine.		Maximum yield per Vine.		Remarks.
	Lb.	oz.	Lb.	oz.	
Foster seedling........	6	8	8	14	An early white grape of fair quality.
Buckland Sweetwater..	4	2	4	4	An early white grape of good quality.
Black Hamburgh.......	6	2	10	2½	Medium early black of excellent quality.
Muscat Alexandria....	2	2½	3	0	Excellent quality, white, shy setter.
Gros. Maroc..........	4	3½	4	9	A handsome black grape, very large, good quality.
Muscat Hamburgh...	5	0	5	8	A black grape of good quality.
Mrs. Pearson	3	1½	4	3	A white grape of good quality, but a shy setter.
Madresfield Court......	3	8	4	8	Small bunches, very large handsome berry, fair quality but poor keeper.
Black Alicante....	4	13½	6	8	Good quality black grape, late.
Gros. Coleman......	2	8	4	12	Poor quality, large, handsome, very watery.
Frankenthal	7	9	7	14	Good quality, black, same as Muscat Hamburgh.
Royal Muscadine...	2	0	2	0	Small white grape, poor in quality and yield.
Alnwick Seedling....	1	0	1	0	Fair quality, poor setter.
Grizzly Frontignon....	2	9	3	10	Poor quality, not recommended.
Mrs. Pince...........	1	0	1	0	
Lady Down Seedling...	2	7½	2	8	
Prince of Wales.....	4	0	4	12	A very large berry, handsome large bunch, good quality, black grape, promising.

The total yield from the whole house which contained fifty vines was 187 pounds 4½ ounces, or an average of 3 pounds 8½ ounces per vine.

Frankenthal gave twice this amount as an average per vine, and Foster Seedling and Black Hamburgh gave nearly twice this amount.

It may be added that it has been decided to discard Grizzly Frontignon, and Royal Muscadine owing to poor quality, appearance, and productiveness.

FARMERS' MONTHLY EXPENSE SHEETS.

Attention is again called to the monthly expense sheets issued free by this Division, and which were just prepared last season, reference having been made to them in the 1913 report.

Since that time over one thousand of these have been distributed to persons requesting them, but it is hoped that a much larger number of farmers will take an interest in the matter, and make an attempt to ascertain the cost of production of their different crops. These sheets are simple and handy, and can be readily understood by any person. They will be sent free on application to the Dominion Horticulturist.

THINNING EXPERIMENTS WITH WEALTHY APPLES, 1914.

A thinning experiment on a small scale was conducted with 12 Wealthy apple trees, three being left unthinned, three having 19 per cent of the fruit removed, three having 25·9 per cent removed, and three having 30·1 per cent removed.

The apples were removed from the trees about the time that they were the size of large walnuts and every apple removed was counted.

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At the time of harvesting, all apples harvested from these trees were also counted. In this way a record of the total number of apples originally on the trees was obtained.

In the packing, the apples were graded into fancy, No. 1, No. 2, No. 3 and culls, and were sold on the market as such, a record being kept of the pack-out from each plot, and of the returns obtained in the sale of the different grades of fruit.

The results of the experiment appear as follows:—

TABLE No. 1.—Pack out results in 11-quart Baskets.

Plot.	Fancy.	No. 1.	No. 2.	No. 3.	Culls.	Drops.	Total No. of baskets.
Thinned 25·9 per cent	2	10	13	13·5	3	41	82·5
" 30·1 "	8	18	4	4·5	3	32	69·5
" 19· "	2	5	5	12·	3	20	47·
Not thinned	0	15	11	16·	3·5	65·5	111

TABLE No. 2.—The above results expressed as percentages.

Plot.	Fancy.	No. 1.	No. 2.	No. 3.	Culls.	Drops.	
Thinned 25·9 per. cent	2·4	12·1	15·7	16·3	3·6	49·6	
" 30·1 "	11·5	25·8	5·7	6·4	4·3	46·	
" 19· "	4·	10·6	10·6	24·6	6·3	42·5	
Not thinned	0	13·5	9·9	14·4	3·1	59·	

It will be noted that the greatest percentage of No. 1 and Fancy apples came from the plot thinned 30·1 per cent, while the total Fancy and No. 1 apples from the other two thinned plots is about equal and very little in excess of the unthinned plot. The percentage of culls, it will be seen, remains about the same for all four plots.

Now in order to compare the actual merits of the thinned and unthinned plots, it will be necessary to determine what the results from the unthinned plot would have been, had it been thinned. By actual count the unthinned plot produced 11,786 apples, and 39 of these were required to fill a gallon, while from the plot thinned 30·1 per cent, only 29 apples were required to fill a gallon.

Now had the unthinned plot been thinned, 30·1 per cent of the apples would have been removed, which would have left 8,239 apples to be harvested in the autumn.

The size of the apples would then have increased to the same sizes as those from the 30·1 per cent thinned plot, or to 29 per gallon.

This would have given yield in gallons of 8,239 ÷ 29, or 284 gallons, whereas the actual yield was 300 gallons, so that there was a decrease in total yield of 16 gallons, or 5·3 per cent.

This loss due to decrease in yield, however, may have been offset by the increased value of the apples resulting from thinning. This can be arrived at by working out the pack-out from the above theoretical yield, using the percentage actually obtained from the 30·1 per cent plot.

These pack-out results show that the 30·1 per cent thinned plot gave:—

11·51	per cent.	Fancy Apples.
25·8991	"	No. 1.
5·7553	"	No. 2.
6·4748	"	No. 3.
4·3165	"	Culls.
46·0431	"	Windfalls.

Referring now to table No. 1 and using these percentages on the crop from the unthinned trees it is found that had they been thinned to 30·1 per cent the total crop would have been 103 11-quart baskets instead of 111 as was the actual case. The pack-out would have been as follows:—

11·8 baskets	fancy	Valued at	$ 3 54
26·6 "	No. 1	"	6 65
5·8 "	No. 2	"	1 30
6·6 "	No. 3	"	1 32
51·9 "	Culls and drops	"	2 59
	Total		$ 15 40
Instead of 15 baskets	No. 1	Valued at	$ 3 75
11 "	No. 2	"	2 47
16 "	No. 3	"	3 20
69 "	Culls and drops	"	3 45
	with a total value of		$ 12 87

This gave a gain of $2.53 for the three trees in this plot. Against this is the cost of thinning, which amounted to $1.05 in this plot, leaving a net gain of $1.48 for the three trees. This figuring out for an acre with 45 trees on it would mean a net gain of $22.20 due to thinning.

Working on these same principles it was found that the results of the other three plots appear as follows:—

When 20·1 per cent of the fruit was removed the gain was 20 cents, but when cost of thinning was considered this turns to a net loss of 70 cents, or $10.50 per acre.

When 16·1 per cent of the fruit was removed a gain of 69 cents resulted, or a net loss of 16 cents, when cost of thinning was considered. This equals a loss of $2.40 per acre.

It will be seen from these results that only in one instance did thinning pay, but in that one case the profit was worth while. From these results it appears that thinning may or may not pay, depending upon the amount of fruit removed, and also upon conditions over which there is no control. In every case uniform trees were selected as much as possible.

CURRANTS.

Following will be found a list of the red, white and black currants tested at this Farm. The average yields given are the result of an 11-year test, except in those cases where a special note is made to the contrary.

During the winter of 1911, which was exceptionally severe for bush fruits, considerable winter killing was evidenced, and a number of varieties were almost entirely killed back. This gave an especially good opportunity to note the hardy varieties, and the results of these observations are given in a separate column headed "Winter Injury in 1911."

ELEVEN Years Test of Red Currant yields based on six bushes of each variety. 1904-14.

Variety.	Yield. lb.	oz.	Winter Injury During 1911.
1 London Red	33	7	Wintered well.
2 Red Grape	32	14	" "
3 Red Dutch	32	14	" "
4 Simcoe King	32	12	" "
5 Cumberland Red	28	7	Severely injured.
6 Rankins Red	28	6	Slightly injured.
7 Long Bunched Holland	28	0	Wintered well.
8 Knight Large	27	8	" "
9 New Red Dutch	26	14	" "
10 Franco German	26	7	" "
11 Ribes Striatum	25	2	" "
12 Raby Castle	24	2	" "
13 Moore Seedling	24	0	" "
14 Victoria Red	23	7	Half killed back.
15 Pomona	23	0	Wintered fairly well.
16 Red English	22	7	50% injured.
17 Greenfield Red	21	9	25% injured.
18 La Conde	20	12	Wintered well
19 Large Red	20	10	50% killed.
20 Wentworth Seedling	19	14	Wintered well.
21 Goliath	19	3	25% injured.
22 Ringens	16	12	Wintered well.
23 Champagne Red	15	13	" "
24 Wilder	14	13	10% injured.
25 De LaRochepoze	14	2	Wintered well.
26 Benwell	13	0	15% injured.
27 Early Scarlet	11	15	Wintered well.
28 Versaillaise	9	12	50% injured.
29 Fertile d'Angers	7	0	Nearly all killed to ground.
30 Fay Prolific	6	0	Killed to ground.
31 Admirable	3	14	
32 Defiance	3	1	

AVERAGE yield Red Currants for six years only, six bushes each variety, 1909-14.

Variety.	Yield. Lb.	Oz.	Winter Injury During 1911.
1 London Market	29	11	Wintered well.
2 Prince Albert	20	12	"
3 Seedling from D. Murray	15	5	"
4 Diploma	15	0	"
5 Red Cross	13	7	"
6 Perfection	12	2	"
7 Caucasian	9	15	25% injured.
8 Comet	6	9	35-50% injury.
9 Raspberry Currant	4	13	
10 Chautauqua	4	12	50% injured.
11 Knight Improved	2	12	15% injury.
12 Rote Kernlose	1	14	Wintered well.
13 Bar Le Duc (White)	..	2	"

ELEVEN Years Test of White Currant, yields based on six bushes of each variety. 1904-14.

Variety.	Yield. Lb.	Oz.		Winter Injury during 1911.
1 White Cherry	24	12		Wintered well.
2 White Imperial	18	15		" "
3 Large White	18	13		25 per cent killed.
4 White Dutch	18	10		5 per cent injured.
5 Eyatts Nova	17	11		15 " "
6 White Kaiser	16	15		Wintered well.
7 Verrieres White	16	3		" "
8 Large White Brandenburg	15	5		" "
9 Climax White	15	1		Injured slightly.
10 White Grape	14	10		Wintered well.
11 White Pearl	14	6		15% injured.
12 Champagne White	10	15		25% "
13 White Gondouin	10	10		Wintered well.
14 Wentworth Leviathan	9	1		5% injured.
15 Frauendorfer	7	12	4 yrs.	25% "
16 White Transparent	6	6	4 "	Wintered well.

ELEVEN Years Test of Black Currants, yields based on six bushes of each variety, 1904-14.

Variety.	Yield. Lb.	Oz.	Winter Injury During 1911.
1 Kerry	24	6	Wintered well .
2 Ontario	23	14	Five per cent injured.
3 Ogden	23	14	Wintered well.
4 Magnus	21	0	"
5 Saunders	20	2	"
6 Topsy	19	13	"
7 Eagle	19	1	"
8 Black Grape	18	2	"
9 Clipper	17	8	"
10 Beauty	17	7	"
11 Eclipse	17	3	"
12 Climax	17	3	"
13 Merveille de la Gironde	17	2	Ten per cent injured.
14 Buddenborgs	16	12	Wintered well
15 Ethel	15	6	"
16 Collins Prolific	15	0	"
17 Victoria Black	14	6	"
18 Prince of Wales	14	5	"
19 Bang Up	14	0	Five per cent injured.
20 Lee Prolific	14	0	Wintered well.
21 Prince	13	14	"
22 Norton	12	14	"
23 Success	10	1	Wintered fairly well.
24 Black Champion	9	7	Ten per cent injury
25 Orton	8	4	"
26 Black Naples	8	7	Twenty-five per cent injured.

RASPBERRIES.

Variety testing has been the main feature of the work in raspberries for the past number of years. As records of yields are available for a long period, reliable information concerning the bearing qualities of the older varieties is here given.

The first table shows the average yield of the best thirty varieties of raspberries for a period of nine years, these being the results from two different plantations.

It is worthy of note that the six heaviest yielders of this period are all varieties originated in Canada. Herbert, which heads the list for the second time, thus easily holding its own, is a chance seedling of Mr. R. B. Whyte, of Ottawa; the next five, Shinn, Brighton, Count, Sir John, and Muriel are all varieties organized by the late Dr. Wm. Saunders.

Some forty-three varieties of English and American origin figured in this eight year test.

Average total yield for Nine Years of the best producing twenty-five varieties, yield of twelve bushes, 1904-7 and 1910-14.

Number	Variety.	Yield. Lb.	Yield. Oz.
1	Herbert	30	10
2	Shinn	24	11
3	Brighton	22	5
4	Count	21	15
5	Sir John	21	5
6	Muriel	19	13
7	Kenyon Seedling	17	15
8	Henry	16	5
9	Cardinal	16	0
10	Craig	14	0
11	Deacon	13	3
12	Lorne	12	12
13	Bigger Seedling	12	11
14	Knevetts	12	8
15	Reliance	12	5
16	Turner	12	1
17	Nelson	12	1
18	Caroline	11	15
20	Columbian	11	1
21	Brandywine	10	10
22	Hiram	10	6
23	Clarke	9	0
24	Rancocas	8	11
25	Phœnix	8	9
26	Marlboro	8	6
27	Red Antwerp	7	11
28	Loudon	7	6
29	Sarah	7	2
30	King	6	6

The foregoing table as previously stated covers a period of nine years. So as to get an idea as to how some of the newer varieties behave, there is appended below a table giving the average total yield of the best thirty varieties for a period of five years, including the yield of 1914, which is the last yield that will be recorded from that particular plantation.

Comparing this test with the first one, it will be seen that the best ten in each case are almost the same varieties, excepting that Louboro, Seedling No. 1 from C. P. Newman and Eaton, three newer varieties, have displaced Kenyon Seedling, Cardinal,

and Craig. Of these three new varieties, Seedling No. 1 from C. P. Newman is very promising. It is a large firm bright coloured berry of good quality, apparently hardy and quite productive. Eaton, though hardy and productive, is crumbly and thus poor for shipping.

AVERAGE total yield of Raspberries for five years ending 1914.

Number	Variety.	Yield.	
		lb.	oz.
1	Herbert	20	15
2	Count	20	13
3	Shinn	18	1
4	Louboro	17	14
5	Sir John	17	12
6	Seedling No. 1 from C. P. Newman	16	15
7	Brighton	16	13
8	Muriel	15	3
9	Henry	15	3
10	Eaton	14	12
11	Highland Hardy	13	0
12	Dr. Reider	12	15
13	Knevetts	12	10
14	Rancocas	11	13
15	Marlative	11	11
16	Kenyon Seedling	11	6
17	Cardinal	11	4
18	June	11	1
19	Ruby	10	14
20	Brandywine	10	14
21	Columbian	10	9
22	Bigger Seedling	10	8
23	St. Regis	10	6
24	Hiram	10	4
25	Caroline	10	3
26	Lorne	10	2
27	Heebner	9	12
28	Marlboro	8	15
29	Sunbeam	8	10
30	Cuthbert	8	8

EARLY RASPBERRIES.

The following table gives the yields of seventeen varieties for the first ten days of picking. This is an average for five seasons. As earliness is an important point, it was decided to adopt this method of arranging the order of merit for this point, rather than depend on the date of the first ripe fruit. A variety, although it may show ripe fruit before another, may not give as large a yield over say a ten-day period, which upon examining the market records, appears to be about the period of time that the price on early fruit is maintained.

This table also gives the average number of days that fruit is picked from the different varieties.

List of best varieties of raspberries for earliness and productiveness. Five years average (1910 to 1914). Earliness based on yields of the first ten days of the season.

Variety.	Average Yield for 1st 10 Days.		Length of Season.
	Lb.	Oz.	Days.
1 Count	10	14·1	26
2 Sir John	10	2·3	25
3 Brighton	8	15·6	28
4 Muriel	7	12·3	23
5 Henry	7	7·85	20
6 Highland Hardy	7	4·45	25
7 Seedling. No. 1 from C. P. Newman	6	7·4	19
8 Shinn	6	6·9	23
9 Dr. Rei'er	5	11·4	26
10 Kenyon Seedling	5	8·25	25
11 Ruby	5	4·9	24
12 Eaton	5	1·45	24
13 Marlative	4	15·19	20
14 June	4	13·3	20
15 Louboro	4	13	24
16 Red Antwerp	4	5·15	21
17 St. Regis	4	2·5	89

"St. Regis" is a so-called everbearing variety. In 1914 the last picking was on October 6.

PROTECTION AGAINST FROST, BY THE USE OF FIRE POTS.

The question of protection against late spring frosts is one that has had the attention of nearly every grower of fruits and vegetables which are subject to its ravages.

Of the various methods devised, only one seems worthy of consideration, and that is the method of raising the temperature of the surrounding air by the use of orchard heaters or fire pots.

TYPE OF HEATER USED.

Although there are many types of heaters on the market, only one was used at the Central Farm, owing to the inability of several manufacturers to supply their heaters at short notice. The type used is known as the Competition Heater, and is one of the simplest forms on the market. The accompanying illustration will explain its simple construction. It has the great advantage of being able to be stored in a comparatively small place, and furthermore there is no mechanical device to get out

of order. Referring to the illustration, it will be noticed that the heater in question consists of an ordinary pail of sheet iron with perforations around the top to allow of a draught of air, there being also a perforated rim which fits into the heater to assist in this draught. The heaters are supplied with a cover to be used during bad weather. On the right of the illustration will be noticed a heater with a reflector attached. This attachment was for the purpose of reflecting the heat downwards, and was designed for use with ground crops. The theory was that by reflecting the heat toward the ground, it would be easier to raise the ground temperature. But this did not work out in practice, as practically no effect was felt at a greater distance than three or four feet from the heater. Furthermore, when used in strawberries, the heat in the vicinity of the heater was so great on the ground that the plants were invariably burned, so that from the data on hand it would appear that the reflector is not a success.

FUEL.

The fuel used in these heaters is what is known as fuel oil, and can be procured from any of the leading oil companies of Canada. It has a specific gravity of about ·85 and a flashing point of ·275. In tank car lots it may be purchased at 6 cents per gallon or less, f.o.b. Ottawa, and in barrel lots at eleven cents, f.o.b. Ottawa.

NUMBER OF HEATERS PER ACRE.

The number of heaters required per acre will depend upon the degree of frost to combat. For ordinary purposes one hundred heaters per acre should be ample, as this number of heaters is sufficient to raise the temperature of the surrounding air eight degrees on the worst night and ten degrees on the average frosty night, a great deal depending upon the wind. The actual ground temperature, however, may not be raised much above freezing point, especially when the frost is of long duration. The difference in the temperature on the ground and just a few inches above the ground is very marked, so if the actual ground temperature has to be raised considerably a larger number of heaters than one hundred would be required for an acre.

METHOD OF DISTRIBUTING THE HEATERS.

The method of distributing the heaters throughout the area to be heated will depend on the quarter from which the wind is blowing. Generally on our frosty nights, the wind comes from between the north and west, so that in this case, there should be more heaters on the north and west sides than on the other sides. It will be readily understood why this is done, as the wind would blow the heat over the rest of the area. If, on the other hand, the wind was from the east and the larger number of heaters were on the west side of the area, the heat would be driven from the western side to a point outside of the area to be heated. It is not a very long task to shift the pots, just before lighting, to suit the night in question, but it is very important to have the larger number of pots well to the windward of the area requiring heating.

The pots should be filled and placed in the field sometime before frost is expected so that everything will be in readiness at a moment's notice. As a good strong cover is supplied with each heater, there will be no danger of rain getting in to dilute the oil, if the heaters are kept covered while not in use.

LIGHTING AND CARE OF HEATERS WHILE IN USE.

As the oil used in these heaters is very crude and unrefined, it has a very high flashing point, or in other words will not ignite readily. Hence, it is necessary to employ some other means of lighting the pots, than by merely applying a lighted match

or torch. If gasoline, which is a very combustible product, is applied to the surface of the liquid in the heaters, and a lighted match or torch then applied, the gasoline will ignite and burn, and by the time it has burned out, it will have raised the temperature of the oil to its flashing point and ignition will take place. In experiments, at this Station, it has been found that only a few drops of gasoline are necessary for this purpose, two quarts is ample for one acre or 100 heaters. In lighting up, the method employed is somewhat as follows:—

First, have all the covers removed from the heaters, which will only take a few minutes. After the covers have been removed, one man starts with a bottle of gasoline (see figure 2) and drops a few drops of the gasoline in the heaters. He is immediately followed by a second man with a lighted torch, who applies the torch to the surface of the pot. In this manner the task of lighting is carried out very quickly. One thing to remember is, do not apply the gasoline until just before ready to light, for it is so volatile that the small amount used will readily evaporate from the comparatively large surface. The torch used may be made out of any stick with bagging wrapped around and tied with wire, then soaked in gasoline or kerosene. Another point worthy of mention is that kerosene or coal oil will not take the place of gasoline, in lighting up. Kerosene will not light quickly and is consequently of no use for that purpose.

REFILLING.

Whether or not the heaters require to be refilled while frost is in duration, will depend upon the length of the frost period. The heaters hold six imperial quarts and will burn anywhere from six to nine hours. Ordinarily this is ample to carry a crop through the worst night we would expect in spring, as at that time of year frosts only last about four hours. If, however, it becomes necessary to refill, it can be safely carried out without extinguishing the flame. The oil is of such a non-combustible nature that it will not explode or cause any harm to the operator when poured into a burning heater. At first there will be a spluttering due to the cold oil coming in contact with the hot pot, but if a long snouted can is used such as is shown in figure No. 3 no danger will appear. It is not advisable, however, to apply the oil from an ordinary bucket, for in this operation the operator may have to put his face too close to the heater and thus may receive burns from the hot spluttering oil. Allowance should always be made for refilling, and barrels of oil should be distributed throughout the area to be heated so as to facilitate the operation of refilling as much as possible. With the oil distributed in barrels at different points, two men can, with a ten-quart long snouted can, care for from two to three hundred heaters on the worst night and keep same properly filled.

EXTINGUISHING.

The fire or flame in the heaters may readily be extinguished by simply placing the cover on the heater. The flame may smoulder for a few minutes, but will soon be extinguished when the cover is placed in position.

SOME RESULTS FROM USING FIRE POTS.

As no frosts were experienced in the late spring, it was decided to test out these orchard heaters in the early fall. So on the night of September 28 the heaters were lighted. On this night, the frost came very early and the thermometer had fallen to 32 degrees before there was any person in the vicinity of the farm, as all the men were home to their suppers. The heaters were lighted, however, at 8.35 p.m., and at this time the temperature was 30 degrees Fahr. on the ground and 32 degrees Fahr. 14 inches above the ground. It might be added that thermometers were placed both inside and outside of the heated area. These thermometers were placed one on the

ground and the other 14 inches above the ground, four thermometers being used for the two areas. These thermometers had all been previously tested and corrected. The thermometers inside the heated area were placed as far from any of the heaters as it was possible to place them. Readings both inside and out were taken at different intervals throughout the night, and the results are recorded below.

Besides depending on the thermometers, young tomato plants from the greenhouse were placed, some inside and some outside the heated area. Next day it was observed that those plants which had been inside the heated area were not injured at all, while those plants which had been outside were entirely killed by frost. As before stated, the heaters were lighted at 8·35 p.m., when the ground temperature was 30 degrees and the temperature 14 inches above the ground was 32 degrees F. At 9·05 p.m., just half an hour after lighting, the temperature inside the heated area had risen to 32 degrees on the ground and 34 degrees 14 inches above the ground, while the temperature outside was 28 degrees F. on the ground and 30 degrees F. 14 inches above the ground. This shows a rise of 4 degrees F. in temperature due to the effect of the heaters.

The following table gives the temperatures both inside and outside the heated area at different hours during the night:—

—	9.05 p.m.		10.30 p.m.		1.30 a.m.		3 a.m.		5.45 a.m.	
	Ground.	14 in. above	Ground.	14 in. above.	Ground.	14 in. above.	Ground.	14 in. above.	Ground.	14 in. above.
	°	°	°	°	°	°	°	°	°	°
Heated area	32 F.	34 F.	33 F.	36 F.	32 F.	34 F.	31 F.	34 F.	32 F.	34 F.
Outside area	28 F.	30 F.	32 F.	34 F.	28 F.	30 F.	24 F.	28 F.	26 F.	29 F.

It will be noted that until 1.30 a.m. the heated area had a minimum temperature of 32 degrees F. against a minimum temperature of 28 degrees F for the outside area. After 1.30, of course, the temperature on the ground, inside the heated area, dropped to 31 degrees F. or 1 degree below freezing point. But it must be remembered that this was some 7 degrees higher than outside the heated area, and that such a frost as this rarely occurs, if ever, during the spring. It is also well to note that at 14 inches above the ground, the minimum temperature inside the heated area was 34 degrees F. as against 28 degrees F. for the unheated area.

This record, coupled with the fact that the tomatoes in the heated area came through uninjured, is fairly good evidence that the heaters are a practical method of fighting frost.

Whether or not it is an economical method, will depend to a very large extent on the margin of profit of the crop in question, although it must be borne in mind that a frost may mean the difference between absolute failure and success and even if the cost of saving the crop eats up the profit, the loss may not be as great as it otherwise would have been had it been allowed to be totally destroyed by frost.

Ottawa.

The following estimate of plant and operating expenses seems fair:

Plant.

Cost of 100 heaters at 31 cents	$ 31 00
1 Frost alarm thermometer	30 00
Total for plant	$ 61 00

Operating Expenses per Acre.

Placing and filling 100 heaters	$ 1 25
Tending 100 heaters, 5 hours, 2 men at ·20	2 00
Fuel (Maximum consumption see below)	12 50
Gasolene for lighting	0 20
Total	$ 15 95

NOTE.—The amount of fuel used may vary from 4 quarts per 4½ hours to 4 quarts per 7 hours, or in cost from $1.60 to $2.50 per acre per hour, depending on the night in question. The frost alarm will also serve for any number of acres so the cost of plant per acre would gradually be reduced.

A FROST ALARM SYSTEM.

Many nights during early spring threaten frosts, which do not actually arrive, or if they do, only come in local areas. On this account, it is very difficult for any person to foretell whether a frost will actually come or not. So that the only way to be on the safe side would be for the grower to sit up and keep watch. As this is a very arduous task, it is quite essential that a frost fighting equipment be supplemented by the addition of a frost alarm. The frost alarm thermometers are very accurate and reliable, and are very simple in construction.

By referring to Figure No. 4 one of these alarm thermometers may be seen. "A" shows the thermometer and "B" shows the battery box and bell. The working is very simple. The thermometer is placed on a post a distance of about six or eight inches from the ground and the battery box and bell are placed in the caretaker's bedroom. The thermometer should be placed in a cold part of the farm where frosts generally strike, and it should not be more than 900 feet from the battery box. The two wires are then led from the battery to the thermometer.

The alarm thermometer is a specially-made instrument with a fine platinum wire fused into the bore of the tube, connecting with the mercury column at 32° F. or any other one permanent point desired. A second wire, touching the mercury at a point below the other, completes a circuit, which is broken the instant the mercury drops below the designated danger point—the permanent point referred to above. A non-sparking special relay battery attachment causes a bell to ring at practically any distance from the thermometer itself, the moment the circuit is broken. Until the alarm rings the danger is not imminent and all unnecessary expense may be spared.

A TEST OF DIFFERENT ARSENATES OF LEAD.

A number of brands of arsenate of lead, both in the powdered and in the dry form were tested as to adhesive qualities and injurious effect upon the foliage. The same were also analyzed by the Chemical Division, and using these analyses as data, it is purported to show that often a lead costing considerably more than another is really the cheaper, on account of its greater percentage of arsenic.

The active ingredient of arsenate of lead is arsenic and upon the amount of this present depends the value of the lead in question, provided it possesses good adhesive qualities and contains less than 1 per cent of soluble arsenic, which, if present in larger quantities, is liable to cause burning of the foliage. The relative adhesiveness of the different brands was determined by what remained on the foliage after each rain.

OTTAWA.

Following is a list of the arsenates of lead tested with the analysis of each and its value as to adhesive qualities appended.

Name of Lead.	Per cent of Arsenic Oxide.	Per cent free Arsenic.	Adhesive value.
Sherwin Williams' N. P. Paste	15·21	·48	60
Sherwin Williams' Dry Arsenate	31·31	·89	70
Grasselli's Paste	16·44	·46	75
Canada Paint Company's Paste	14·35	·59	75
Swift's Arsenate Paste	15·10	·37	50
Canada Paint Company's Powder	32·18	·77	85
Vreeland Chemical Company's Electro Paste	17·15	·27	40
Vreeland Chemical Company's Electro Dry	31·62	·18	30
Bowker's Paste	19·88	·15	45
Thomsen's Standard Paste	18·19	·53	65
Thomsen's Triplumbic Paste	12·25	·25	85
Thomsen's Dry Arsenate	30·76	·51	85

In no instance was the percentage of soluble arsenic as great as 1 per cent and no burning of the foliage resulted in any case although the lead was applied at the rate of 10 pounds to 40 gallons of water. Notes were taken on the foliage from time to time, and after each rain special attention was paid to the amount of lead remaining on the leaves. It will be noted from the foregoing table that the dry lead of the Canada Paint Company and the Thomsen Chemical Company, together with Thomsen's triplumbic lead, are much more adhesive than the others. The Canada Paint Company's powder is considerably more adhesive than their paste, from the same product. The powdered lead appeared to mix with water better, seeming to become more finely divided and thus more sticky. As the value of an insecticide depends to a great extent on its ability to adhere to the leaf for a long time, these notes on adhesiveness are especially interesting. It may be added, that the Canada Paint Company's dry lead was adopted as a standard and in taking the foliage notes all others were compared with it.

With regard to the value of the different leads on the market, it may be added that purchasers should buy such products on the unit basis, that is, they should ascertain the percentage of arsenic oxide which will be given by the manufacturers, and find out just how much they are paying for each percentage of arsenic present. For instance, comparing the Canada Paint Company's paste lead with the Canada Paint Company's dry lead, it is found that the former contains 14·35 per cent of arsenic oxide, the latter 32·18 per cent or more than twice as much. The dry arsenate was quoted at $19 per hundred, while the paste was quoted at $9.75 per hundred. In the case of the paste lead, the purchaser was paying almost 0·68 cent for each per cent of arsenic oxide present, while in the case of the dry form he was paying only a fraction over 0·59 cent for the same thing, a saving of practically 0·9 cent, or 13 per cent. That is, the purchaser could have afforded to pay 13 per cent more for the dry lead than for the paste lead, considering the percentage of arsenic oxide only, but added to this saving is the fact that the freight on the dry lead, to obtain the same quantity of arsenic, is less than on the paste, for in the latter instance freight is paid on water. The powdered form also has the advantage of being better in adhesive qualities.

VEGETABLE GARDENING.

C. F. W. Dreher, B.S.A., Assistant in Charge.

As in the past, the main work of this subdivision has been along the line of variety testing, although a few cultural experiments have been conducted where it was possible to find room for the same.

Probably the most striking new feature of the work in connection with vegetables has been the completion of the new greenhouses, where considerable attention is to be given to the growing of some of the more important crops. Elsewhere in this report will be found the result of some variety tests of tomatoes, also one season's results of different methods of pruning and training the vines.

POTATOES.

Notwithstanding the dry weather in the early part of the season and some injury from rhizoctonia, owing to favourable conditions in the latter part of the summer there was a good crop of some varieties, though the field on the whole was only medium. In the following table is given a list of the best thirty varieties for 1914. In connection with this is added a list of the best twelve varieties for 1912, 1913, and 1914.

The seed of these varieties was obtained from outside sources in 1912, and since that date has been grown and saved at this Station.

According to the results obtained from past experiments imported seed has given better results than seed grown at this Station. The imported seed, of course, came from sections of the country more adapted to potato growing than Ottawa, so that in these special potato districts the same results with imported seed would not probably hold true.

This result with imported seed is attributed to the fact that the vines in this climate dry up long before digging, or long before frost, whereas in such places as the Maritime Provinces the vines remain green till killed by frost, tubers developed under such conditions having stronger vitality than those prematurely ripened by hot dry weather.

Referring to the two tests following, it may be noted that Moreton leads in both.

EXPERIMENTS WITH IMMATURE SEED.

In bulletin No. 49, page 18, of this Farm, experiments with immature potato seed are referred to. This past season experiments to learn more about the value of immature seed were continued.

SEED SELECTION.

Experiments in seed selection were again made this season. The system adopted was to select the best ten hills from a row 66 feet long. These hills were selected according to yield at the time of digging. The yield of these 10 selected hills was then recorded as well as the yield from the remaining part of the row. Next year it is intended to plant equal quantities of seed from both the selected and the unselected

hills, growing them under the same conditions, side by side. In this way any benefit from the selection can be accurately determined.

POTATOES, Thirty Best Yielding Varieties, 1914.

Variety.	Marketable. Bush. Lb.	Unmarketable. Bush Lb.
Moreton	528 00	70 22
Brydon	442 12	61 36
New Dearborn	435 36	13 12
Warrior (C.E.F.)	431 12	52 48
Davies Warrior (O.A.C.)	404 48	46 12
Conquering Hero	400 24	17 36
Long Keeper	396 00	
Dalmeny Regent	391 36	127 36
Manistee	387 12	88 24
Dalmeny Hero	382 48	88 00
New Chieftain	378 24	57 12
Dobbie Prolific	369 36	26 24
Superlative	360 48	35 12
The Scott	360 48	41 48
X from Mrs. Grace	352 00	52 48
White City	347 36	48 24
Aroostook Wonder	338 48	13 12
McIntyre	334 24	61 36
Acquisition	330 00	61 36
Scottish Triumph	319 00	46 12
New Keystone	316 48	39 36
Royalty	316 48	70 24
Sir Walter Raleigh	303 36	39 36
Todd Wonder	303 36	66 00
Brydon Beauty	303 36	66 00
Gold Coin	294 48	44 00
Empire State	294 48	48 24
Snow	294 48	52 48
Table Talk (Lacombe)	294 48	154 00
Jeannie Dean	286 00	57 12

TWELVE Most Productive Varieties of Potatoes, 1912-13-14. Three year average per acre.

	Marketable Bush. Lb.	Unmarketable Bush Lb.
Moreton	334 24	52 4
Empire State	330 00	48 24
Dalmeny Hero	327 4	105 36
Brydon	324 6	57 54
Conquering Hero	314 36	80 48
Dalmeny Regent	305 4	90 54
Clyde	303 36	44 00
Houlton Rose	299 12	56 48
Green Mountain	296 12	55 42
Table Talk	296 12	68 54
Sir Walter Raleigh	288 54	27 6
Manistee	288 54	40 18

GREEN PEAS.

The variety test of peas is divided into separate sections. First, there are the 30-foot rows, which are allowed to ripen for seed and on which careful notes are taken for each variety. These rows, besides serving for seed production, are useful for comparison of the new varieties which, if they do not show promising results in 30-foot rows, are not grown in the 100-foot rows, which are picked for green use.

The 100-foot rows are really the final testing place of the varieties. The seed is sown 1 inch apart in rows 4 feet apart, and careful notes are taken throughout the summer on the yield and other notable points. Following is the result of the 1914 variety test in the 100-foot rows for green use.

OTTAWA.

The varieties are divided into early, medium early, and late. The varieties are all classified according to earliness and yield, not according to yield alone. Notes on the number of days from date of planting to first picking, on percentage of crop picked at first picking, number of pickings made, length of straw and length of pod are appended.

These notes are especially interesting and useful for a person wishing to obtain certain features in a pea, besides yield. For instance, with reference to the number of pickings, it will be noted that Extra Early Pioneer, which gives a yield of 25 pounds and 2 ounces, gave five pickings, whereas another early variety, Thomas Laxton, gave only three pickings, but practically the same total yield, viz., 26 pounds 4 ounces. That is, Pioneer has a much more continuous bearing habit, and for a person wishing a continuous number of moderately sized pickings rather than a few large ones, it is an especially good variety.

Great variation will be noted in the percentage of crop picked at the first picking. For a really early crop the larger the yield at the first picking the better for the commercial grower, as at the beginning of the season the price is considerably higher. A big difference in this respect is noted between First of All and Childs Morning Star, the latter yielding nearly one-half its entire season's crop at the first picking.

Peas, 1914.

—	Record number.	Number days from sowing to first picking.	Number of pickings.	Total crop per 100 ft. row.		Per cent crop picked first time.	Length of straw.	Length of pod.
				lb.	oz.		inches.	inches.
Early Varieties.								
Gregory Surprise	3,316	51	4	29	0	26·72	20	2½
Extra Early Pioneer	3,320	51	5	25	12	32·67	20	2¼
Childs Morning Star	3,319	51	4	25	4	48·51	26	2¼
First of All	3,317	51	3	24	8	16·32	20	2⅜
Thos. Laxton	3,223	54	3	26	4	4[illegible]·71	24	3
Nott Excelsior	3,328	54	3	21	0	38·09	12	2½
Medium.								
Sutton Early Giant	3,322	55	4	23	4	34·40	26	3½
Excelsior (Gregory)	3,324	56	5	36	0	11·11	22	2¾
American Wonder	3,326	56	3	21	8	11·62	24	2
Little Marvel	3,331	56	2	24	0	52·5	14	2½
Sutton Excelsior	3,329	56	3	20	0	25·0	16	2¾
Large Podded Alaska	3,321	58	3	21	0	43·67	..	3
Premium Gem	3,330	58	2	13	8	25·3	30	2½
Hundred Fold	3,327	58	2	12	0	58·[illegible]3	20	3½
Gradus	3,318	61	3	36	0	36·11	36	3½
Green Gem	3,325	61	3	42	0	28·57	36	3
Witham Wonder	3,338	64	3	10	0	50·0	24	3¼
Late.								
Burpee Quality	3,333	66	2	46	0	52·17	36	2¾
Dainty Duchess	3,340	66	2	36	0	89·0	60	4
McLean Little Gem	3,341	68	4	38	0	23·68	36	2½
Quite Content	3,334	69	2	36	0	91·66	60	4½
McLean Advancer	3,335	69	3	71	0	47·88	32	..
Burpee Quantity	3,339A	70	4	55	0	67·3	36	2¾
Cracker Jack	3,315	70	2	50	0	88·0	32	2¾
Lincoln	3,339B	70	2	29	0	62·5	30	3½
Boston Wrinkled	3,336	72	2	40	0	75·0	..	
Juno	3,342	74	2	23	0	52·17	32	
Superlative	3,343	77	3	47	0	29·78	22	
Carter Danby Stratagem	3,337	77	2	42	0	83·33	22	
Sutton Discovery	3,344	77	3	42	0	19·04	..	
Perfection Marrow Fat	3,332	77	2	23	0	82·60	28	

EXPERIMENT IN THE USE OF FARMOGERM, A BACTERIAL CULTURE, ON GREEN PEAS.

Four varieties of pea seed were treated with Farmogerm and three rows 30 feet long of each of these varieties sown. Three rows of untreated seed were also sown at the same time, under the same conditions. Notes on the length of pod, yield and weight of straw were taken. Following is the result of these notes. The results varied considerably with the varieties, as will be seen by the table. The total yield of the four varieties in the treated plots was 25 pounds greater than the yield in the untreated plots. The length of pod seemed to vary as much one way as the other, as also did the weight of the straw. These results cannot be considered at all conclusive, but serve to show that there is a possibility of increasing the yield by the use of nitro cultures.

Variety.	Treated.			Untreated.		
	Length of Pod.	Weight of Straw.	Yield.	Length of Pod.	Weight of Straw.	Yield.
	In.	Lb.	Lb.	In.	Lb.	Lb.
Nott Excelsior	$2\frac{1}{3}$	......	$16\frac{1}{2}$	$2\frac{1}{3}$	12	$17\frac{1}{2}$
McLean Advancer	$2\frac{1}{2}$	12	34	$2\frac{3}{4}$	$8\frac{1}{2}$	34
Juno	$2\frac{3}{4}$	19	43	3	16	24
English Wonder	$2\frac{1}{2}$	6	39	$2\frac{1}{2}$	$8\frac{1}{2}$	32
Totals	......	......	$132\frac{1}{2}$	......	......	$107\frac{1}{2}$

TOMATOES.

Variety tests in tomatoes were continued as well as experiments in training the vines to stakes, contrasted with allowing them to run on the ground.

With regard to the variety tests, the varieties are divided into three classes, early, medium early, and late. The early varieties are then classified according to the yield of marketable fruit for the first two weeks, commencing from the day that fruit is first picked from the earliest variety.

The medium early varieties are classified by total yield, and include those varieties which take not more than one week longer to ripen fruit than the earliest.

The late varieties include all those which take more than one week after the first variety has shown fruit to ripen. These are also classified according to total yield of marketable fruit. The column marked "number of days" gives the number of days from sowing until ripe fruit first appeared, following this is a column containing the yield for the first two weeks, and contains the total yield of marketable fruit for the whole season. The last column records the yield of green and bad fruit. The table gives the yield from five plants of each variety. All varieties were sown on the same date and handled in the same manner. In the field they were planted 4 by 4 feet apart.

Alacrity, which is the selected C.E.F. strain of Earliana, continues in the lead as an early variety, other strains of Earliana coming close up to the top.

Those varieties under the heading "late varieties" are altogether too late for this district and are not to be recommended for planting. Only the best of the early and medium early varieties should be grown in sections as far north as Ottawa.

OTTAWA.

TOMATOES, 1913-1914, Classified for Earliness, according to Yield for first two weeks. Two year average from five plants.

Variety.	Number of days.	Fruit first two weeks.		Total yield Ripe Fruit.		Yield of bad and green Tomatoes.	
		Lb.	Oz.	Lb.	Oz.	Lb.	Oz.
Alacrity	126	18	9	48	13	38	6
King Edward (Blue Stem Early)	128	16	12	20	15	40	13
Extra Early Wealthy	126	16	10	43	10	39	10
Earliana	120	16	6	49	8	30	8
XXX Earliest	127	15	6	52	6	38	8
Crimson Cushion	128	13	13	46	7	38	5
Early June	126	13	10	49	9	34	1
Northern Adirondack No. 3	128	12	9	34	1	32	4
Earliest of All	126	11	3	41	1	34	6
Carter Sunrise	129	10	14	39	0	48	7
Dobbie Earliest	127	8	10	26	0	44	11
Earlibell	124	8	3	33	12	37	0
Bonny Best	128	7	13	31	12	35	3
Dominion Day	128	7	9	25	12	41	2
Prosperity	132	7	6	38	3	34	2
Chalk Early Jewel	129	6	5	37	7	34	6
Industry	131	5	8	26	3	36	3
Florida Special	130	4	13	25	15	36	13
Dobbie Champion	129	2	11	21	3	43	10
Ignotum	131	2	0	18	5	42	14
Freedom	131	1	8	15	2	29	13

MEDIUM Early Tomatoes, classified according to total yield of ripe fruit.

Variety.	Number of Days.	Yield First Two Weeks.		Total Yield.		Bad and Green.	
		Lb.	Oz.	Lb.	Oz.	Lb.	Oz.
I. X. L.	134	14	2	46	15	31	9
Crimson Cushion	128	13	13	46	17	38	5
Selected Earliana	132	9	9	45	0	37	6
Prosperity	132	7	6	38	3	34	2
First and Best	134	10	0	33	9	57	6
Jack Rose	136	16	7	32	4	49	0
Sutton Satisfaction	130	5	13	27	5	35	8
Watts Wonder	131	5	14	24	9	46	4
Livingston Globe	134	4	7	22	10	33	0
Comet	134	3	9	22	3	48	12
Chalk Early Jewel	136	4	5	21	9	55	10
Superb Salad	136	8	4	20	12	44	2
Early Detroit	134	3	7	16	3	41	9
Sutton Winter Beauty	135	7	8	14	10	48	10
Acme	134	4	5	14	8	54	0
Sutton A 1	133	5	3	13	4	35	13
Great B.B	138	2	5	9	4	40	1
Dwarf Champion	136	2	12	7	13	45	12
Santa Rosa	134	1	13	7	0	38	4
Late varieties classified according to total yield							
Livingston Beauty	140	4	5	13	0	54	6
Great Baltimore	159	6	4	11	14	44	9
Trucker Favorite	150	5	2	10	12	41	2
Red Rock	147	5	11	10	10	46	6
Selected Stone	145	3	15	9	12	39	1
Ponderosa	151	8	4	9	8	58	0
Magnificent	145	1	9	9	0	61	10
Success	154	4	11	8	15	38	13
Livingston Hummer	144	3	8	7	5	60	12
New Magnificent	152	4	5	7	4	52	0
Enormous	141	6	10	5	10	21	2
Livingston Coreless	147	2	9	5	0	54	7
Beefsteak	150	5	3	5	0	61	7

OTTAWA.

EXPERIMENT WITH STAKING AND PRUNING TOMATOES.

Three different plots of tomatoes each containing eleven varieties and five plants of each variety were used. One plot was pruned to a single stem and trained to an upright stake, the second plot was pruned to three stems and trained to a stake, while the third plot was pruned to three stems and allowed to run on the ground without any support.

The following table gives the list of those varieties, together with the total yields and dates of ripening. It will be noted that there was less unmarketable fruit from the vines grown on stakes than from those grown on the ground, although in a few instances the vines on the ground showed less unmarketable fruit than those on the stakes. In no case did the ground vines ripen any earlier than those on the stakes, while in nearly every instance the vines grown to stakes ripened from one to twenty-four days earlier than the ground vines. The vines pruned to a single stem were in most instances earlier than those pruned to three stems.

The fruits from the staked plants were much more handsome, and nicer in appearance. From these results it seems that pruning to a single stem and training to a stake is a better method to obtain early fruit than pruning to three stems, and that either method has superior advantages over the ground method.

EXPERIMENT with Staking and Pruning, 1914.

Variety.	Culture on One Stake.	Date of Ripening.	Total Yield. Ripe fruit.	Total Yield. Bad fruit.	Total Yield. Green fruit.
			lb. oz.	lb. oz.	lb. oz.
Chalk Early Jewel	1 stake	Aug. 4	15 0	1 0	12
	3 "	Sept. 8	18 0	4 0	25
	3 vines on ground	Sept. 9	15 0	14 12	25
Early Dawn	1 stake	Aug. 4	18 0	2 3	15
	3 "	Sept. 4	18 4	1 7	25
	3 vines on ground	Sept. 4	13 2	1 4	25
Satisfaction	1 stake	Aug. 15	32 0	0 9	15
	3 "	Sept. 4	29 8	1 5	30
	3 vines on ground	Sept. 8	24 4	4 5	20
Byron Pink	1 stake	Aug. 15	21 8	4 0	25
	3 "	Sept. 8	25 4	1 8	25
	3 vines on ground	Sept. 8	16 12	2 14	25
Bonny Best	1 stake	Aug. 15	27 0	0 4	20
	3 "	Aug. 31	22 12	1 2	30
	3 vines on ground	Sept. 8	23 8	2 0	30
Livingston Beauty	1 stake	Aug. 20	19 9	0 10	15
	3 "	Sept. 8	20 4	0 14	40
	3 vines on ground	Sept. 14	5 5	2 10	30
Chalk Early Jewel	1 stake	Aug. 4	26 0	1 13	15
	3 "	Sept. 4	21 8	1 7	30
	3 vines on ground	Sept. 8	22 8	7 3	30
Holyrood	1 stake	Aug. 17	25 0	0 11	20
	3 "	Sept. 19	13 0	0 4	40
	3 vines on ground	Sept. 8	13 0	0 2	25
Earliest of all	1 stake	Aug. 15	33 4	1 14	15
	3 "	Aug. 31	38 4	3 9	15
	3 vines on ground	Aug. 31	19 3	7 2	15
Red Rock	1 stake	Aug. 17	8 4	0 2	20
	3 "	Sept. 19	48 0	0 4	30
	3 vines on ground	Sept. 4	15 2	1 4	30
Livingston Globe	1 stake	Aug. 20	8 4	2 4	20
	3 "	Sept. 25	8 0	1 0	25
	3 vines on ground	Sept. 19	7 0	0 4	45

OTTAWA.

EXPERIMENT IN PRUNING CUCUMBERS.

One hill of each of the nine varieties included in the test was pruned in the following manner:—

The vines were pinched back when they had about four leaves on them. The tips of the leader were simply pinched off, and the operation was repeated in about two weeks' time. This had the tendency to induce much lateral growth.

The pruned vines in every case except one showed a larger number of marketable fruits than the unpruned, and the total yield of marketable fruits from all the pruned vines was thirty-two fruits more than from the unpruned, or 19 per cent greater. The total yield of all kinds of fruit was 286 fruits from the pruned and 234 from the unpruned. Of these the pruned vines gave 52 per cent of marketable fruits and 48 per cent unmarketable, while the unpruned gave 49 per cent marketable and 51 per cent unmarketable fruits.

The difference in percentage of marketable and unmarketable fruits from the two methods does not seem very great, but the difference in total yield is considerable, and in favour of the pruned vines.

Variety.	Pruned.			Unpruned.	
	Date of pruning.	No. of fruits marketable.	No. of fruits unmarketable.	No. of fruits marketable.	No. of fruits unmarketable.
Davis Perfect	August 20	22	17	17	15
Early Fortune	" 20	22	15	11	13
White Spine	" 20	21	18	15	12
Fordhook Famous	" 20	20	10	19	11
Giant Pera	" 20	12	17	10	12
Prosperity	" 20	18	21	13	15
New Century	" 20	6	13	8	12
Klondyke	" 20	19	16	16	18
The Mimms	" 20	7	12	6	11
Total yield	....	147	139	115	119

OTTAWA.

MUSKMELONS.

Twenty-four varieties of muskmelon in all were tested this past season. All melons were started in the greenhouse in strawberry boxes, five plants being grown to a box. At the time of removing to the hotbeds, the three best plants were selected and allowed to remain in the box, while the other two were removed. This gave three plants to a hill, and each hill occupied one light of the hotbed. A trench about two feet deep and two feet wide was dug through the centre of the hotbed and filled with manure. This gave bottom heat to the hills and at the same time was much less expensive than filling the whole area of the bed with manure.

The yields recorded were for one month only, beginning at the first picking. Following is a list of the best ten varieties, classified according to earliness and yield, and also according to total yield only.

Muskmelons, 1914.—List of best ten early melons, classified according to date of ripening and yield. Yield taken for one month only in every case.

Variety.	Date of ripening.	Number of fruits.	Total weight of fruits.	Yield from
			Lb.	
Earliest Ripe	July 12	39	35	July 12 to Aug. 12
Improved Watters Solid	" 14	43	36	" 14 " 14
Paul Rose	" 14	40	33	" 14 " 14
Rocky Ford	" 14	39	30	" 14 " 14
Flat Jenny Lind	" 15	34	28	" 15 " 15
Long Island Beauty	" 16	24	58	" 16 " 16
Irondequoit	" 16	21	46	" 16 " 16
Daisy	" 16	43	45	" 16 " 16
Isbell Grand	" 16	36	39	" 16 " 16
Emerald Gem	" 16	33	27	" 16 " 16

The best ten melons classified according to total yield only:—

Variety.	Date of ripening.	Total weight of fruits.	Yield from
		Lb.	
Montreal Market	July 22	78	July 22 to Aug. 22
Surprise	" 23	63	" 23 " 23
Long Island Beauty	" 16	58	" 16 " 16
Montreal Nutmeg	" 29	52	" 29 " 29
Cox Strain	" 31	50	" 31 " 31
Hackensack	" 18	47	" 18 " 18
Irondequoit	" 16	45	" 16 " 16
Daisy	" 16	45	" 16 " 16
Sweet Sugar	" 16	42	" 16 " 16
Isbell Grand	" 16	39	" 16 " 16

EXPERIMENT IN GROWING MELONS IN POTS VERSUS GROWING IN STRAWBERRY BOXES.

The method of growing melon plants in the greenhouse ready for outdoor work has in the past always been in strawberry boxes, growing three plants to a box. Thus each box constituted a hill. An experiment in which this method was contrasted with

that of growing each plant in a separate pot was conducted. When the plants were set out in the frames, the plants from the pots were placed three in a hill, the same as those in the strawberry boxes. The size of pot used was 3 inches. There appeared to be no advantage gained by using the pots, in fact the total yield from the vines sown in pots was nearly seventeen pounds less than from the same number of vines sown in strawberry boxes.

The strawberry boxes also have the advantage of being able to be packed closer, and thus take up less room in the greenhouse.

Variety.	Grown in Baskets.			Grown in Pots.		
	Ready for use.	Total yield.		Ready for use.	Total yield.	
		Lb.	Oz.		Lb.	Oz.
Irondequoit	July 18	19	2	July 20	6	11
Earliest Ripe	" 14	9	10	" 12	8	3
Hackensack	" 21	14	14	" 18	8	8
Hoodoo	" 30	18	0	" 27	9	12
Cox Strain	Aug. 6	18	8	Aug. 7	3	10
Montreal Market	July 27	13	14	July 25	26	4
Burrell Gem	" 18	7	8	" 18	6	2
Rocky Ford	" 17	6	0	" 18	8	1
Improved Watters Solid	" 14	6	14	" 15	8	3
Isbell Grand	" 16	8	6	" 18	11	0
Spicy Cantaloupe	" 25	8	6	" 23	12	8
Melting Sugar	" 28	12	0	" 27	13	12
Henderson Bush	" 17	5	4	" 17	5	5
Flat Jenny Lind	" 20	9	9	" 16	6	4
Surprise	" 25	9	12	" 29	14	6
Fordhook	" 21	11	12	" 18	5	4
Johnson Dreamwold	" 20	3	12	" 18	9	15
Field Daisy	" 19	8	0	" 18	12	6
Improved Montreal Nutmeg	Aug. 4	12	12	Aug. 2	10	12
Jenny Lind	July 17	10	4	July 21	9	8
Sugar Sweet	" 19	16	2	" 16	10	6
Long Island Beauty	" 20	17	2	" 19	10	6
Emerald Gem	" 17	9	2	" 16	9	8
Paul Rose	" 18	5	0	" 16	9	9
Total Yield		260	15		233	9

EXPERIMENT IN PRUNING AND PINCHING BACK MELON VINES.

The pinching was done when the melons were transplanted from the boxes to the frames, or very shortly after, the tips of the central shoot being removed. After the vines had made about one and a half or two feet of growth the shoots were again pinched off. This causes the production of laterals, and enables the vines to be more easily distributed in the frames, and as the laterals bear melons the largest crop of melons possible is obtained from a small space. As soon as the melons were fit the shoots were pinched off at about two nodes beyond the fruit. This is also done to economise space.

The results from this year's pruning test are given in the following table:—

RESULTS of Pruning versus not Pruning in Melons.

Name.	Pruned			Unpruned.		
	Read for use.	Total yield.		Ready for use.	Total yield.	
		Lb.	Oz.		Lb.	Oz.
Irondequoit	July 16	15	2	July 18	19	2
Earliest Ripe	" 12	11	11	" 14	9	10
Hackensack	" 18	14	0	" 21	14	14
Hoodoo	" 28	11	4	" 30	18	8
Cox Strain	" 31	25	10	Aug. 6	18	0
Montreal Market	" 22	26	2	July 27	13	4
Burrell Gem	" 20	11	14	" 18	7	18
Rocky Ford	" 14	8	6	" 17	6	0
Improved Watters Solid	" 14	10	2	" 14	6	14
Isbell Grand	" 16	9	4	" 16	8	6
Spicy Cantaloupe	" 22	9	10	" 25	8	6
Melting Sugar	" 25	2	12	" 28	12	0
Henderson Bush	" 18	6	9	" 17	5	4
Flat Jenny Lind	" 15	6	0	" 20	9	9
Surprise	" 24	26	10	" 23	9	12
Fordhook	" 17	6	8	" 21	11	2
Johnson Dreamwold	" 18	7	12	" 20	3	12
Field Daisy	" 16	13	6	" 19	8	0
Improved Montreal Nutmeg	" 29	26	2	Aug. 4	12	12
Jenny Lind	" 18	8	12	July 17	10	4
Sugar Sweet	" 15	7	0	" 19	16	2
Long Island Beauty	" 16	8	10	" 20	17	2
Emerald Gem	" 16	13	14	" 17	9	2
Paul Rose	" 14	9	5	" 18	5	0
Total yield		284	5		261	15

From the foregoing list it will be seen that pinching back gave earlier fruit in nearly every case, the difference in favour of pinching being as high as six days in some cases. In fact in four cases only did the unpruned vines set fruit earlier, and in these cases were only one and two days earlier. In three cases there was no difference. In the others the average gain due to pinching amounted to three and a quarter days, ranging from a gain of two days to six days.

The total yield from the pruned vines was 22 pounds and 10 ounces greater than that from the unpruned.

DESCRIPTION OF A FEW OF THE BEST VARIETIES OF MELONS GROWN AT THE CENTRAL EXPERIMENTAL FARM IN 1914.

Melons may be divided into two distinct classes according to size, one in which the melons are of small size, averaging from less than a pound to a pound and a half, and another in which they are of distinctly larger size, ranging from two to even as high as five pounds and sometimes over.

In the first class are such melons as Rocky Ford, Paul Rose, Jenny Lind, Earliest Ripe, and Emerald Gem. These small melons are considerably earlier than the larger sizes and are of excellent quality. The larger class of melons includes such varieties as Montreal Market, Long Island Beauty, Hackensack, and Surprise.

Although all melons were grown in the hot frames last year, it is intended in future to grow only those of the larger class in the hot frames, growing the smaller ones in the open covered with small forcing frames to start them off in the spring.

The total yield received from the smaller melons hardly warrants the expenditure of as much time and labour as is entailed in frame culture.

Larger Class of Melons.

Muskmelon—Montreal Market.—Size 6 inches by 6 inches; form, roundish oblate; sections—distinct, deep; colour—light green, turning yellow; flesh—green, firm, juicy; flavour, very sweet and fine; quality—very good; season, July 22 to August 22. Strong plant and vigorous.

Muskmelon—Long Island Beauty.—Size $5\frac{1}{2}$ inches by 6 inches; Form, roundish oblate; sections—distinct, deep; colour—light green, turning yellow; flesh—green, firm, juicy; flavour, very sweet and fine; quality—very good; season, July 16 to August 16. Good plant.

Muskmelon—Hackensack.—Size $4\frac{3}{4}$ inches by $6\frac{3}{4}$ inches; form, oblate; section—deep; colour—turning golden yellow; netting—strong and close; flesh—$1\frac{3}{8}$-inch, green, soft, juicy; flavour—sweet, somewhat coarse; quality—medium to good; season, July 18 to August 18; weight—4 pounds; plant very good and vigorous.

Smaller Sized Melons.

Muskmelon—Flat Jenny Lind.—Size, $3\frac{1}{2}$ inches by 4 inches; shape, oblate, smooth; sections—distinct, medium, deep; colour—dark green turning yellow; netting—strong, close, uniform; flesh—green, juicy, sweet, $\frac{3}{4}$ inch; flavour—good; quality—very good; season—July 15 to August 15; fair plant.

Muskmelon—Rocky Ford.—Size, $4\frac{7}{8}$ inches by $3\frac{7}{8}$ inches; form—oval, attractive; sections—indistinct, shallow: colour—dark green; netting—strong, close; skin—thick; flesh—green, juicy; flavour—sweet; quality—medium to good; season—July 14 to August 14; fair plant.

Muskmelon—Paul Rose.—Size 5 inches by $4\frac{3}{8}$ inches; form—oval; sections—distinct, shallow; colour—dark green; netting—strong, fairly close; flesh—salmon pink, $1\frac{1}{8}$-inch; flavour—good, strong; quality—good; season—July 14 to August 14; weight—1 pound; fair plant.

Muskmelon—Jenny Lind.—Size, $3\frac{1}{2}$ by $4\frac{1}{8}$ inches; form—oblate, knobbed at apex; sections—distinct, fairly deep; colour—light green; netting—strong and close; flesh—green; flavour—fair; quality—medium; season—July 17 to August 17; weight, 1 pound; fair plant.

BEANS.

The following varieties were sown for green picking in 100-foot rows and gave the following yields in green or string beans. The column marked "number of days" refers to the number of days from time of sowing until the beans were ready for use.

Varieties.	Record No.	Yield Lb.	Yield Oz.	No. of days till ready for use.
Lazy Wife Pole Bean	0·3690	132	0	59
Extra Early Refugee	0·3668	125	8	61
Extra Early Valentine	0·3667	119	8	63
Scarlet Runner Pole Bean	0·3689	88	0	73
New Hodson Wax	0·3663	80	0	74
French Stringless Runner Pole Bean	0·3684	80	0	91
Galega Refugee	0·3669	77	0	74
Horticultural D.P.B	0·3671	76	0	85
Fordhook Favorite	0·3672	69	0	60
Improved Black Wax	0·3675	64	8	62
Grennell Pencil Pod	0·3665	64	0	57
Keeney Rustless Wax	0·3670	63	0	74
Red Valentine	0·3676	59	0	61
Sutton Plentiful	0·3679	59	0	60
Dwarf Chocolate	0·3673	57	0	73
Tender and True	0·3685	56	0	88
New Kidney Wax	0·3674	52	0	69
Horticultural Pole Bean	0·3694	52	0	74
Full Measure Bushel	0·3677	51	0	71
Superlative	0·3680	51	0	57
Fordhook Favorite	0·3682	48	0	74
Davis Wax	0·3678	42	0	60
Everbearing Kidney Wax	0·3666	40	0	97
French Stringless Runner Pole Bean	0·3687	40	0	49
Extra Early Refugee	0·3683	37	8	71
New Giant Podded Pole Bean	0·3688	32	0	90
Prize Winner	0·3686	32	0	81
New Hodson Wax	0·3664	31	0	73
Grennell Pencil Pod	0·3691	28	0	84
Keeney Rustless Golden Wax	0·3693	26	0	76
Extra Early Valentine	0·3692	24	0	87

TOMATO EXPERIMENTS IN THE GREENHOUSE.

Experiments in different methods of training tomatoes in the greenhouse were conducted, also a test of some of the best varieties for greenhouse work.

The training or pruning experiments consisted of growing the vines to a single stem as compared with growing to two and three stems. In the two and three-stem plots, the effect of pinching at different dates was also tried out.

The one-stem plants were set 18 inches apart each way, and the two-stem plants 2 feet apart each way, while the three-stem plants were put 3 feet by 2½ feet.

The accompanying table gives the results of these experiments. The yields are all worked out per square foot, as the object of the experiment was to determine which method of training would give the highest yield per square foot.

Yields of marketable fruit per square foot from different methods of training and pinching:—

1 stem		2·77	pounds per square foot.
2 stem, pinched	August 6	1·53	" "
2 "	one week later	1·32	" "
3 "	August 6	·78	" "
3 "	one week later	·84	" "

The one-stem plants gave by far the largest yield per square foot and in addition to this they ripened their fruit much earlier giving their first picking sixteen days earlier than any of the other methods. For Bonny Best the dates of ripening for the different methods were:—

1 Stem	November	3.
2 stem, pinched August 6	"	9.
2 " one week later	"	21.
3 " August 6	"	12.
3 " one week later	"	21.

It will be seen from the above that the three-stem plants were the latest, and also that the second pinching in both cases gave later ripening plants. Part of the lateness of the first pinching in both the two- and three-stem plots may be due to this practice as the one-stem plants were not pinched at all.

For both this and the following experiment, the seed was sown on July 11, 1914. Seeds germinated July 14. Plants pricked into three inch pots July 23 and into four inch pots August 11; and planted into the bed on September 5.

VARIETY TEST OF TOMATOES IN THE GREENHOUSE.

Twelve varieties were tested, all being planted 18 inches apart and trained to a single stem. The dates of ripening and total yields are recorded below on a comparative basis of thirty-six plants of each variety.

Variety.	1st Picking, 1914.	Total yield of marketable fruit. lb.	oz.
1 Hipper No. 2	November 6	131	6
2 Frogmore	" 3	105	9
3 Livingston Globe	" 3	103	10
4 Bonny Best	October 31	103	0
5 Dobbie Champion	November 3	101	13
6 Sutton Winter Beauty	" 3	101	1
7 Comet	October 31	98	1
8 Sutton A 1	" 31	89	4
9 Dobbie Earliest	" 31	87	9
10 Industry	" 31	80	2
11 Sutton Satisfaction	November 3	74	4
12 Early Dawn	October 31	67	1

A NEW METHOD OF BLANCHING CELERY.

This past season a new method of blanching celery was tried and found very satisfactory. This method was the use of a commercial product called "Celery Bleacher," which resembles very much many of the roofing papers on the market. It is made in two widths, 12 inches and 15 inches, and comes in large rolls. The material is simply placed around the row of celery and kept in place by wires which are bent in the form of a staple and inserted in the ground, the bleacher passing between the two sides and thus being prevented from spreading or rising.

The practical benefit to be derived from this method is that of economy of land, for by using this bleacher, celery may be grown in rows three feet apart instead of four feet apart as was the case in the old method of dirt blanching. The material will last for years with care and should not in the long run be an expensive proposition. Any composition roofing paper of the right height will serve the purpose, the only thing to bear in mind being to obtain a product that does not give off any odour of tar, as this might be absorbed by the plants during blanching.

OTTAWA.

LIST OF BEST VEGETABLES.

Asparagus.—Palmetto is proving a better variety than Conover Colossal for general planting, as it is not so subject to the disease known as Asparagus Rust. Argenteuil is also a good variety.

Beans.—Round Pod Kidney Wax and Wardwell Kidney Wax are two of the best yellow podded or wax bush beans, and are both early. The Hodson Wax is a large podded variety which has proved productive. Stringless Green Pod, Early Red Valentine and Early Refugee are three good, green-podded varieties. Refugee or Thousand to One is one of the best later sorts. Among Lima beans, the dwarf or bush forms are the most satisfactory.

Beets.—Meteor, Detroit Red, Crosby Egyptian and Eclipse are some of the best.

Borecole or Kale.—Dwarf Green Curled Scotch.

Brocoli.—White Cape.

Brussels Sprouts.—Improved Dwarf. The Dwarf varieties have been found more satisfactory than the tall-growing ones.

Cabbage.—Early Jersey Wakefield, Copenhagen Market (early), Succession (medium), Danish Ballhead (late), and Drumhead (a Savoy variety . Red Dutch is a good red. Houser has been found freer from disease than most. For extra early use, Paris Market is desirable, being nearly a week earlier than Early Jersey Wakefield.

Cauliflower.—Early Dwarf Erfurt and Early Snowball.

Carrots.—Chantenay is one of the best, but if a good extra early sort is required, the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Golden Self-Blanching (Paris Golden Yellow) (early), French Success, Noll Magnificent, Perfection Heartwell, Evans Triumph, Winter Queen are all good late varieties. London Red is a good red one. White Plume is desirable for the prairies.

Corn.—Malakoff, Early Malcolm, Peep o' Day (extra early), Early Fordhook, Early Cory (early), Crosby Early, Golden Bantam, Metropolitan (second early), Perry Hybrid, Early Evergreen and Black Mexican (medium), Stowell Evergreen, Country Gentlemen (late). In planting, the Country Gentlemen should not be omitted, as it lengthens the season very considerably and is of fine quality. Golden Bantam is the best second early for home use. It is of excellent quality.

For the prairie provinces and other parts of Canada where the nights are cool, Squaw and Extra Early Adams, though not sweet varieties, develop better than others.

Cucumbers.—Peerless White Spine or White Spine, Davis Perfect, Cool and Crisp, and Giant Pera are some of the most satisfactory. Boston Pickling and Chicago Pickling are good pickling sorts.

Egg Plant.—New York Improved and Long Double Purple succeed best.

Lettuce.—Grand Rapids, Black-seeded Simpson (early curled), Iceberg, New York, Giant Crystal Head, Crisp as Ice, and Improved Hanson (curled cabbage), Improved Salamander (uncurled cabbage). Grand Rapids is the best variety for forcing. Iceberg remains headed longest in summer, and should always be planted. Trianon and Paris are two of the best Cos varieties.

OTTAWA.

Melons.—Musk: Long Island Beauty and Hackensack are two of the earliest and best of the nutmeg type. Montreal is later, but of larger size and finer flavour. Emerald Gem and Paul Rose are two of the best yellow-fleshed melons.

Melons.—Water: Cole Early, Salzer Earliest, Ice Cream, Phinney Early are some of the most reliable.

Onions.—Yellow Globe Danvers and Large Red Wethersfield are two of the best and most reliable. Australian Brown is also good. For the prairies, the Early Flat Red is one of the most reliable. Prize Taker is a good variety for transplanting.

Parsley.—Double Curled is as good as any.

Peppers.—Cayenne, Chili, Cardinal. The Early Neapolitan is one of the earliest of the large peppers.

Peas.—Gregory Surprise (extra early), Thos. Laxton, Gradus, American Wonder, Nott Excelsior, Premium Gem (second early), McLean Advancer, Heroine and Stratagem (medium to late). The foregoing varieties, not being tall growers may be grown without supports. Quite Content, Telephone and Champion of England are three of the best tall-growing sorts.

Potatoes.—Early: Rochester Rose, Early Ohio (pink), Irish Cobbler, Eureka Extra Early, Early Petosky, New Early Standard (white), Bovee (pink and white), Main Crop: Carman No. 1, Gold Coin and Green Mountain (white). Table Talk and Davies Warrior are very promising.

Radishes.—Early: Scarlet White Tipped Turnip, Rosy Gem, French Breakfast, Red Rocket (red), Icicle (white). Late: White Strasburg, Long White Vienna. Winter: Long Black Spanish, Chinese Rose-coloured, New White Chinese or Celestial.

Rhubarb.—Linnaeus, Victoria.

Salsify.—Long White, Sandwich Islands.

Spinach.—Victoria, Thickleaved.

Squash.—White Bush Scalloped, Long White Bush, Long Vegetable Marrow, Summer Crook Neck. Late: Delicious, Hubbard.

Tomatoes.—Early: Sparks Earliana, Alacrity, Chalk Early Jewel, Bonny Best, Dominion Day (scarlet). Medium: Matchless, Trophy (scarlet), Livingston Globe, Plentiful (purplish pink).

Turnips.—Early: Extra Early Milan, Red Top Strap Leaf. Early Turnips are usually bitter to the taste and not desirable.

Swedes.—Champion Purple Top, Skirving Improved.

ORNAMENTAL GARDENING.

(F. E. Buck, B.S.A., Assistant in Charge.)

The purpose of the work of the Experimental Farms being manifold it is but natural that that purpose should include the improvement of the surroundings of the home.

At first thought it might be considered that those activities, which are carried on at the Experimental Farms, in connection with such a purpose, would be more in keeping with the other phases of Experimental work, were they concentrated on the improvement of rural and farm homes. However, if due consideration be given to the question, it soon becomes apparent how intricately woven together are all types of homes, whether farm, rural, suburban or city, and this question of home improvement is then seen to have a wider significance. The real aim of these activities in ornamental gardening is then the production of a finer type of Canadian home, irrespective of whether it happens to be the abiding place of labourer, farmer or merchant.

The policy therefore directing such activities, is one based on a full appreciation of the demands of a developing home-making spirit seeking national expression. A policy which seeks to encourage, as far as possible, the improvement of home surroundings whether such be limited to a 25-foot city lot or extend to several acres around the farmhouse.

Inasmuch as all surroundings of the home depend, in the first place, upon a suitable assortment of hardy plants arranged in tasteful ways, in order to make such surroundings attractive and pleasing, it becomes necessary for the Horticultural Division of the Farms to experiment with a large number of such plants. These plants are put under test for the purpose of finding out which of them are best suited to meet the varying conditions of climate and soil found in Canada. Such plants then, or in other words, the material which is used for beautifying the external parts of the home may be classified, for convenience, as follows:—

First.—Ornamental and flowering trees and shrubs in several thousand species and varieties.

Second.—Ornamental and flowering herbaceous perennial plants also in several thousand species and varieties.

Third.—Ornamental and flowering annual plants in many hundred species and varieties.

There are also to be included with these plants, lawn grasses, certain forest trees and other forms of plant life which are frequently used in the work of ornamental gardening.

The work which is involved in dealing with these plants, when briefly outlined, falls under four or five headings. There are:—

1. *The work of introducing and testing New Plants and Novelties.*—In connection with this phase of the work, it may be stated that frequently novelties and plants new to Canadian conditions, make their first appearance at the Central Farm, Ottawa. Novelties listed each year by various seedsmen are grown and reported on as soon as they are offered to the public. In addition, large numbers of plants, valuable in other

countries, are introduced into Canada by the Farms System. In the allied line of work, namely, that of testing out well-known plants, the aim is to find out the best strains and varieties from the many offered to the public, and to advise, through the media of the Report and Bulletin, which are most suitable for Canadian conditions. The test work deals with all of the groups of plants mentioned above.

2. *The work of Demonstrating How, Where and When to grow the best plants for all conditions is the second phase of the work.*—It involves the actual growing of the plants in beds and borders and the grouping of shrubs and trees on lawn and roadside, etc., to demonstrate the uses of various ornamental plants. In other words, it is the landscape phase of the work and includes the laying-out of the home lot and certain types of ornamental grounds.

3. *Best Cultural Methods.*—Next in importance to the work of finding out the relative hardiness and use of plants comes the matter of the best cultural methods. Within a single group of plants, the rose for example, several methods of culture must be followed, to suit the different needs of the different varieties. Much information has been gathered during recent years with regard to cultural requirements of popular flowers like the sweet pea, China aster, etc., but in this same connection much work remains on the programme of the future. The number of quotations reaching the Farm in this connection is very steady and continuous.

4. *Combating Insect Pests and Plant Diseases.*—And last but by no means least in importance, is a phase of work which is still in its beginning stages, and that in spite of the fact that a very great deal has been done already, here and elsewhere, to solve some of its difficulties. Such work has to do with spraying, and other methods adopted to prevent the ravages of insect pests and fungous diseases. The practical problems as far as ornamental plants are concerned, are, however, very numerous and involve much labour and careful attention.

It should be pointed out, that the last three phases in particular, of the activities in ornamental gardening, bring the work of the Experimental Farms into touch with city more than country people. While the many local horticultural societies have done such splendid work during the past few years and have wrought an invaluable service in creating an interest in beautiful homes and gardens, it should be pointed out that their activities do not lessen but rather make more vital and fundamental similar national work at the Experimental Farms.

In the following pages, this report deals this year with a limited section only of the work carried on at Ottawa. Much of the work can be reported on, in an interesting and useful way, only when such work is dealt with as it matures.

The report on the sweet pea this year is not final. It does, however, sum up a large number of interesting facts which have been recorded to date.

The report on the annual flowers is of such a character that it has to be recorded each year in this way in order to be of the greatest use.

Other work besides that reported on at greater length in the following pages, which should be mentioned briefly, is as follows:—

NEW GREENHOUSES.

One of the new greenhouses, which were built at the Farm during the past year for the use of the Horticultural Division has been set aside for the work connected with ornamental gardening. In this house experimental work is now started which aims to solve simple problems, etc., in connection with the care and culture of plants in the house, and the best plants for home use. In this house are also grown the bedding plants used on the Ornamental Grounds of the Central Farm, and many of the annuals tested each year will be started in this house from now on.

OTTAWA.

NEW BULBS.

Some new varieties of Darwin tulips, narcissi, iris germanica, paeonies and roses made useful and interesting additions to the collections of these plants which are tested each year at the Central Farm.

Amongst the tulips the new Darwins proved the attraction of the season. The variety Baronne de la Tonnaye proved its merit as a bedding variety. It came splendidly even, finely tall and beautifully symmetrical. It remained in flower from May 22 till June 9, a period of eighteen days. This is a record number of days for a bedding tulip to remain in bloom. It should prove a popular bedding variety as it is not expensive. Other beautiful and promising varieties of the Darwins are:—Bartigon, Clara Butt, Edmee, Europe, Galathea, Isis, King Harold, Madame Krelage, Yellow Perfection, Cupido, Ouida, Professor Rawenhof, Whistler and Dream.

Amongst new narcissi which gave a good account of themselves are Albatross, Eyebright, Laureate, Cornelia, Lucifer, Spinnaker, Torch and Seagull.

NEW IRIS AND PAEONIES.

A collection of new varieties of *Iris germanica* and a few *Iris Kaempferi* were obtained in 1912. During the past spring and summer many of them flowered for the first time. Many of them are not, as far as they indicate at present, improvements on the older varieties already grown at the Farm. Others, however, are of promise and will prove valuable additions to this group of flowers. *Iris Kaempferi* or the Japanese iris, blooms much later and is a most striking and useful flower when it succeeds well. It needs much more moisture than the German Iris. The latter is perhaps one of the hardiest and most useful of those plants which will stand adverse city conditions.

Many of the new paeonies imported in 1912 flowered for the first time this past spring. The paeony does well at Ottawa and is one of the flowers which, during its season, is a rival of the rose. Its popularity is merited because it will succeed where the rose is often too tender.

ROSES.

Lists giving the merits, colours, etc., of the newer roses imported since 1911 will be found in the New Edition of the Rose Bulletin. The very severe winter of 1913-14 did not injure the bushes to any extent, and the method of protecting them has been followed again this winter. The crop of flowers during the summer of 1914 was very luxuriant, and many very beautiful new varieties were seen at their best. The new race of Austrian Hybrids or Pernetiana roses promises to become a charming addition to bedding varieties for the rose garden. These roses appear to be about as hardy as the Hybrid Tea roses.

OTTAWA.

MODERN SWEET PEAS.

"Here are sweet peas on tip-toe for a flight,
With wings of gentle flush, o'er delicate white,
And taper fingers catching at all things
To bind them all about with tiny rings."

Keats, many years ago, wrote thus of the sweet peas. The modern sweet pea is as superior, however, to the flower of the same name which he so charmingly immortalized in verse, as is the modern garden rose to the wild rose of the wayside.

Up till about the middle of the last century the sweet pea was of one type only and the colours were few, not more than half a dozen. The modern sweet pea, however, which is solely the product of plant hybridists from about the year 1870, is of several types and its range of colour is almost unlimited. The fact that there are now so many varieties of this popular flower is one reason why a rather comprehensive test has been carried on in connection with it, at both the Central Experimental Farm at Ottawa and at many of the Branch Farms in various parts of the Dominion.

MAIN OBJECT OF SWEET PEA TRIALS.

As suggested, there are many colours, shades and tints of the modern sweet pea, at least forty or fifty. This, of course, may not be a source of confusion to the amateur grower of this beautiful flower, but what, however, is undesirable in this connection is the fact that any one particular shade or tint of sweet peas may be sold and described by twenty different firms as twenty different varieties. This does cause confusion in the minds of all who grow this flower. The first main object of the comparative trials at the Central Farm, therefore, has been to find out which, two or three out of a dozen or twenty exactly similar differently named varieties, are the best in any particular shade, tint or colour. In many cases it is impossible to pick out just one and say, "that is the best." It is, however, generally more simple to pick out several, or even half a dozen, from a much larger number and give them premier places. This is particularly true of pink sweet peas, as there is a very large number of differently named but similar peas in this colour or its tints. The first choices in connection with peas of more pronounced colours like blue or chocolate-maroon are more easily made, as named varieties are not as plentiful.

Each year a large number of new sweet peas known as the "novelties of the year" are offered by the raisers to the public. The Central Farm has for several years past carefully tested such novelties. In some cases they prove to be superior to the older varieties, in others inferior. This year the new white sweet pea introduced by one of the largest growers, named "King White," proved itself to be the best white at the Central Farm and it is so recorded in the list which follows. Several of the older sweet peas in other colours did not have to give place, however, as far as the Ottawa trials indicated, to newer introductions of supposedly superior merits.

The second main object in connection with the trials is that of acquiring fuller and reliable information in regards to the best methods of culture for the sweet pea. What have been found, so far, to be the best methods are dealt with under a subsequent paragraph.

And the third main object in the same connection, is that of testing out methods which are best suited for the control of the insect troubles and diseases of the sweet pea vine. What has been found effective in such connections is also recorded in subsequent paragraphs.

SWEET PEAS AT OTTAWA.

For some years past sweet peas have been grown under trial conditions at the Central Farm at Ottawa. Many interesting points with regard to cultural methods and the effects of season have been recorded. Each year for the past three years one

hundred and fifty or more of the best varieties have been selected from the principal growers of this continent and Great Britain. To each of about fifteen of the Branch Farms duplicate but smaller collections have also been sent, for the purpose of making as complete observations, as possible, of the effect of climatic conditions on the productiveness and success of this flower.

The Spencer type of sweet pea has been used more than any other for these trials. A few of the best and better known varieties of the grandiflora type have been included. In this connection it may be well to add a few more historical notes on the origin of the modern sweet pea, especially those known as Spencer types.

HISTORICAL NOTES.

A hundred years ago few people thought anything of the sweet pea. To-day it is known and highly esteemed by at least fifty per cent of the population of modern countries where it will grow successfully. About twenty years ago real enthusiasm for the fragrant flower began to develop, and now during the months of May, June and July, countless millions of these fairy-like flowers are picked by delighted enthusiasts for the sake of their fragrance and charm as decorative flowers. For decorative uses the type known as the Spencer, or waved, is the best.

The origin of the Spencer type of sweet pea, with its waved and fringed segments, dates back to July, 1901, when the variety known as Countess Spencer, a beautiful pink, was first shown at the National Sweet Pea Society of England at the date of its annual exhibition in London. It was originated by Mr. Cole, then gardener to Earl Spencer. From 1870 up till that date many fine varieties of sweet peas had been produced, chiefly by such experts as Mr. Henry Eckford, but they were of the grandiflora type, the segments of which are not waved as they are in the beautiful Spencer types.

While waviness or frilling adds a new beauty to the sweet pea, it must not be concluded that all other types are discounted by not having such waviness. Many of the old smooth, or grandiflora, types are still very popular and will always remain so. There is now an immense demand for sweet peas. The present popularity of this flower is no doubt, however, due to the introduction of the Spencer type.

In the matter of type or form, the modern sweet pea may be grouped into three divisions, that is, those with smooth standards, like Dorothy Eckford; those with hooded standards, like Lady Grizel Hamilton; and those with waved standards, like Countess Spencer. But these divisions should not be bothered with except by those who are interested in raising new varieties. Probably the public will never be sufficiently enthusiastic over one form to discriminate in its favour against all others, especially as all forms of the sweet pea are beautiful. It is to be expected, therefore, that for many more years there will be popular varieties amongst all types of the sweet pea.

COLOUR OF SWEET PEAS.

Colour in sweet peas is a modern development. Seedlings of the Spencer types have added to the already considerable number of colours which hybridists produced in the older types prior to the introduction of the Spencers in 1901-1903. But the sporting or variable habit of the Spencer peas has given a number of additional shades and tints. It may be of profit to note here that the word "shade" should be used to signify a colour which has been deepened or strengthened by the addition of a black pigment, and a tint is a colour which has been reduced or lightened by the addition of a white pigment, that is, in mechanical manufacture this is the method of producing shades and tints. In the matter of colours, in flowers, nature has several methods of creating new tints and shades, and of course, colours. It is too technical a question to deal with here. It is mentioned, however, to explain the following system of classification.

The sweet peas in the following list are grouped first of all into one large group indicated by a colour. Such group is then further divided into its tints and shades and possibly hues (a hue generally signifying a colour produced by a mixture of two or more colours). With regard to this grouping, it must be pointed out that it is a tentative plan used in the test plots in order to facilitate more expeditious note-taking on the merits of the varieties. While it is a plan of colour classification, which differs from the more usual plans, it has its merits, it is believed, as it enables one to see at a glance certain interesting facts relating to colour in sweet peas, and its practicability in the work of classification in the test plots is another recommendation.

It has been thought wise to add to this list a second one which follows an alphabetical plan of colour classification. In many cases the ranking of the peas is different. As, however, no two lists of the best sweet peas is alike, this is of secondary importance. The list is a valuable one although several years old.

Best Sweet Peas, from notes revised to 1914.

Colour.	One of the Best of the Colour.	Other Choices of Same Colour.
White	King White	Etta Dyke, Dorothy Eckford, Nora Unwin, Burpee White.
Cream	Primrose Paradise	Mrs. Collier, Clara Curtis.
Chocolate or Purplish-Maroon	Nubian	Othello Spencer, Paradise Colossus, Black Knight.
Blue, and shades and tints of blue—		
Light Blues	Princess Mary	Helen Pierce, Flora Norton Spencer, Paradise Celestial, Wedgewood, Zephyr, Empress Eugenie.
Dark Blue	Lord Nelson	
Rose and Lavender	Tennant Spencer	Orchid, Asta Ohn, Irish Belle, Mrs. Walter Wright.
Bluish Lavender	Florence Nightingale	Paradise Peacock, Moonstone.
Red, and shades and tints of red—		
Scarlet Crimson	King Edward Spencer	Maud Holmes, Dobbie Sunproof Crimson, Crimson Paradise.
Scarlet	Scarlet Emperor	Queen Alexandra, Vermillion Brilliant.
Ruby Red	Ruby Palmer	
Pink, and shades and tints of pink—		
Light Pinks	Lady Evelyn Eyre	Martha Washington, Elsie Herbert, Mrs. Hardcastle Sykes, Prima Donna, Zarina, Duplex Spencer, Paradise Cherry Ripe.
Creamy Pinks	W. T. Hutchins	Ethel Roosevelt, Mrs. Routzan, Lilian, Paradise Ivory, Mrs. C. W. Breadmore, Mrs. Hugh Dickson, Helen Chetwynd Stapylton.
Blush Pinks	Dainty	Charm, Agricola.
Rosy Pinks	Margaret Altee	Paradise Comet.
Deep Rosy Pinks	Mrs. Cuthbertson	Jeannie Gordon, Constance Oliver, Hercules.
Salmon and Orange Tints—		
Salmon Pinks	Mrs. R. Hallam	Zarina Spencer, Janet Scott.
Orange and Pinkish-Salmons	Helen Lewis	Edron Beauty, Stirling Stent, Barbara, Illuminator.
Orange Scarlets	Thomas Stevenson	Saint George.
Flakes Various Colours—		
Pinkish Salmon Flakes	Aurora	Miss Willmott, Mrs. W. J. Unwin.
Pinkish Cerise Flakes	Apple Blossom Spencer	Mrs. A. Ireland.
Maroon Red Flake	America Spencer	
Chocolate Brown Flake	Senator Spencer	
Various—		
Carmine Cerise	Cerise Spencer	Rosabelle, George Herbert, Prince of Wales, John Ingman.
Rose Carmine	Rose du Barri	
Pale Lavender Lilac	Moonstone	
Light Mauvish Lavender	Charles Foster	

BEST SWEET PEAS, recommended by National Sweet Pea Society of Great Britain.

Bicolour	Mrs. Cuthbertson, Arthur Unwin, Mrs. Andrew Ireland and Colleen.
Blue	Flora Norton Spencer, Mrs. G. Charles and Lord Nelson.
Blush	Mrs. Hardcastle Sykes and Princess Victoria.
Carmine	John Ingman.
Cerise	Cherry Ripe, Chrissie Unwin and Coccinea.
Cream, Buff and Ivory	Clara Curtis, Paradise Ivory and Isobel Malcolm.
Cream Pink (pale)	Mrs. Routzahn, Mrs. Hugh Dickson and Gladys Burt.
Cream Pink (deep)	Doris Usher, Mrs. R. Hallam and Constance Oliver.
Crimson	Sunproof Crimson, Maud Holmes and King Edward Spencer.
Fancy	Afterglow, Charles Foster and Prince George.
Lavender	Masterpiece, Asta Ohn and Florence Nightingale.
Lilac or Pale Mauve	Mauve Queen, Winsome and Mrs. R. H. Carrad.
Magenta	Menie Christie.
Marbled and Watered	May Campbell and Helen Pierce.
Maroon	Nubian, Tom Bolton and Black Knight Spencer.
Maroon Purple	Arthur Green and Mrs. J. M. Gerhold.
Maroon Red	Red Chief.
Mauve	Queen of Norway, Tennant Spencer, Wenvee Castle and Helio-Paradise.
Orange Pink	Edrom Beauty, Helen Grosvenor and Helen Lewis.
Orange Scarlet	Thomas Stevenson, Dazzler and Edna Unwin.
Picotee Edged (Cream ground)	Mrs. C. W. Breadmore and Evelyn Hemus.
Picotee Edged (White ground)	Elsie Herbert, Marchioness of Tweedale and Mrs. Townsend.
Pink	Elfrida Pearson, Hercules and Countess Spencer.
Rose	Rosabelle, Marie Corelli and Marjorie Willis.
Salmon Shades	Stirling Stent, Barbara, Melba and Earl Spencer.
Scarlet	Red Star, Scarlet Emperor and George Stark.
Striped and Flaked (Chocolate on grey ground)	W. R. Beaver and Senator Spencer.
Striped and Flaked (Red and Rose)	Mrs. W. J. Unwin, America Spencer and Aurora Spencer.
Striped and Flaked (Purple and Blue)	Loyalty and Suffragette.
White	Etta Dyke, Nora Unwin and Dorothy Eckford.

SOME ADVICE ON SOWING.

The seed of sweet peas, especially the higher priced named varieties, is very variable. Some of it is large and plump, while some of it is small and shrivelled. Most of it, however, will be found to be highly germinable in spite of appearances.

A good garden loam which is neither too sandy nor too heavy is the proper soil for sweet peas. To such soil should be added some well rotted barnyard manure which should be worked in thoroughly a few inches below the ground level. This should be done in the autumn if possible. Before planting the seed, compact the soil thoroughly by tramping or rolling.

The seed may be sown late in the previous autumn if desired, but the practice should not be followed unless good results have previously been attained by so doing. In Eastern Canada April is the month in which sweet pea seed should be sown. At Ottawa the best results have followed when the seed was sown from April 15 to 20.

There are many ways of sowing the seed. A trench may be made about two inches deep and the seed sown in it at regular intervals. At Ottawa the best results have been obtained by means of a simple home-made marker. This contrivance consists of a piece of 2 x 6-inch scantling four feet long. On one side of this scantling a double row of wooden pegs are inserted. The distance between the two rows of pegs is four inches and the distance between the individual pegs three inches. Each peg is about the thickness of a little finger and two inches long, plus an inch

or so for inserting into the scantling. The scantling on the top side is provided with two handles. The method of using it is to take hold of it by means of the handles, place it in position on the prepared row, and stand on it. The weight of the body will force the pegs their full two inches into the soil. Lift it up carefully and a double row of even depth holes three inches apart will be the result. The peas are then dropped into the holes and a little loose soil from the edge of the row should be raked over them to fill them. By using the back of the rake this may be done very rapidly and thoroughly. At Ottawa every hole is used, as it has been found from experience to be wise to allow for about a fifty per cent loss due to the attacks of birds, cutworms, and similar troubles. In small gardens when full protection might be possible so that every pea survived, it would be wise to thin out every other pea, or every other hole might be skipped at the time of planting. From experiment at Ottawa those peas which do best are those which have an average distance of from 5 to 8 inches between them. In British Columbia as in Great Britain a greater distance even as great as twelve inches seems to be wiser in order to allow for the greater growth of vine. Sowing in a trench, which is filled up gradually as the peas grow, has not shown up to advantage when tested out with other methods.

SOME ADVICE ON GROWING.

Watch, stake, water, spray, are expressions which suggest four lines of activity which must be followed during the growing period of the sweet pea vines.

In the early stages the young peas must be watched to guard them against destruction from birds, cutworms, mice and other enemies, principally cutworms, however. Cutworms may be destroyed when they occur by applying the poison bran-mash, recommended for many other crops as well, particulars for making which will be found in the spray calendar issued by the Central Farm. Sparrows when troublesome are kept away by various methods such as netting and poison baits.

Whether wire, brush or trellis work and string be used to support the vines it should be provided for them in the early stages of growth. Vines which have the chance of climbing from the start do very much better than those which are stunted through non-provision of such facilities. A little careful watching at the start will greatly aid them in making their best efforts in climbing in the desired direction. Wind and light both influence the direction in which a vine will climb, and this should be remembered when placing the supports.

In the matter of watering sweet peas it should be kept in mind water may be applied for two very different purposes. First of all they must be well watered during periods of drought, to keep them growing vigorously. In applying water in dry times it is far better to give the ground a thorough soaking once or twice a week than to apply smaller quantities every night. The surrounding earth should be kept well cultivated to a depth of several inches. This will promote healthy growth and save the soil from baking or drying out. The second purpose for which water may be applied is to keep down the attacks of insects, which live on the sap drawn from the foliage, such as green plant lice and the red spider. A thorough spraying of the foliage with as powerful a spray as can be obtained is generally efficient in keeping in check the attacks of these pests. Such spraying may be given every morning or evening in hot weather. A hose and a fine nozzle is all that is necessary, although a spray apparatus may be used to equal advantage.

Where the attacks of these insects have reached a stage when they can be no longer controlled by the water treatment, other spray mixtures must be used, and for this purpose a small spray pump must be used. At the Central Farm it has been found that a nicotine solution, used as recommended in the spray calendar, will effectively control plant lice, Red spiders, however, are much more difficult to control, and if

the weather is very hot and dry their attacks result in serious consequences. Further experiments in this connection are under way. Water, flour paste, sulphur, etc., have given but partial satisfaction up to the present.

With regard to fertilizers for sweet peas, it may be stated that unless one has had previous experience in applying chemical fertilizer it is far safer to rely on the barnyard manure, applied as directed, and careful subsequent treatment. Bone meal, however, may be worked in with the manure if it is deemed necessary.

SOME ADVICE ON SHOWING.

The sweet pea is one of the favourite flowers of the day for exhibiting at local flower shows. In a large number of cases exhibitors are already conscious that to win prizes demands as much skill in picking, packing, and showing effectively as it does in growing. Too often well grown sweet peas fail to win a prize because they are not picked or shown properly.

In the matter of picking, it is well to pick them either the evening before the day of the show or very early the same morning. As they are picked they should be stored somewhere in a cool shady place. It is best not to have the water in which they are placed too cool; it is better for it to be quite warm. The place of storage, however, must not be warm nor dry; a damp cellar is a good spot. The reason for this is that in a damp place no evaporation can take place from the flowers themselves, and if the water in which they are placed is warmer than the surroundings, it will flow up the flower stems quickly and prevent the flowers from wilting in the slightest degree.

Care should be exercised in packing them for transit to the show hall, not to crush the blossoms. The basket or box in which they are packed should be kept covered.

The art in showing is to depict the individuality and beauty of a few flowers as much or more than it is to produce effect by massed quantities. When six or twelve blooms are called for by the term of the prize list that number only must be shown, and if they are so arranged that the judge can see at a glance the length of the stem and the number of blossoms to a stem, if other things are equal, it is much more likely that they will receive his consideration for a place amongst the prize winners.

ANNUALS.

In 1912 about 375 varieties of annual flowers were grown from seed procured from various seed firms on this continent and in Europe. In 1913 the number was increased, and in 1914, 500 varieties were under trial. The purpose of growing these flowers has been stated already, but it should be added here that in 1914 the experimental work with them was extended to include the growing of about 100 varieties raised from seed gathered at the Central Farm during the previous summer of 1913. The plants raised from this seed compared favourably in every way with those raised from seed sent out by various seedsmen of highest repute.

The seasons at Ottawa are generally favourable for good growth and profuse bloom of most of the annual flowers. This is, of course, also true of many other parts of Canada with respect to these flowers. Annuals, therefore, are probably destined to play no inconsiderable part in the development of the "Beautiful Homes" movement in Canada. Attention was drawn to the fact, in the last annual report, that they possess as a class, many unique advantages, some of which are denied to many of the other classes of flowering plants.

The following notes call attention to several new varieties which were grown at Ottawa for the first time this year. In some cases, no doubt, this means also that it is the first time such plants have been grown in Canada. Amongst the plants of newer introduction there are many, as will be noticed, which have no particularly new merits as garden flowers. Some of the "novelties" of the year also had, as is generally the case, very little to recommend them in points of superiority to older and well known flowers.

Following is a list of the best of the newer or little known annuals from those grown during the summer of 1914:—

Abronia umbellata (Sand Verbena).—A plant of trailing habit about 12 inches high, with Verbena-like rose-coloured flowers, very suitable for rock work. In bloom from July 1 to middle of October.

Amaranthus tricolor splendens (Joseph's Coat).—A striking ornamental foliage plant with leaves rather broader than those of the ordinary Amaranthus. The leaves are glowing scarlet crimson with yellow and bronze green. Height, 2½ to 3 feet—rather tender to frost.

Arctotis grandis (African Daisy).—A half hardy plant growing about 2 feet in height, producing a pleasing and attractive effect in the border; has large white Marguerite-like flowers, each one being very symmetrical in form and having a bluish centre surrounded by a narrow golden band. Unfortunately, however, the flowers have a habit of closing up during parts of the day which militates somewhat against its usefulness. In bloom from July 10 to middle of October

Calandrinia grandiflora (Rock Purslane).—A handsome hardy annual with fleshy leaves, height about 15 to 18 inches. It bears attractive rose-coloured flowers, but inasmuch as they are produced very sparingly the plant is not so useful as it otherwise would be. In bloom from July 10 to middle of October.

Cleome, Giant Hybrids (Spider Flower).—A tall plant growing from 3 to 4 feet in height. Produces long petaled starry flowers arranged in terminal heads. Flowers are produced in several colours, but mostly shades of pink and purple. Useful for decorative groups in a conservatory, or outside border.

Dahlia, Single Collarette (Seedlings).—Plants make a vigorous growth and attain a height of about 3 feet. Flowers produced in a number of pretty colours, many of them very attractive. These single Dahlias, on account of the ease with which they may be raised from seed sown about the beginning of April, will probably make a great addition to our border plants. In bloom from July 7, till early October.

Dahlia, Double Collarette (Seedlings).—Plants similar to the single varieties and equally vigorous. Flowers produced in mixed colours and of several types, not so attractive on the whole as the single Collarette dahlias, but recommended for certain parts of the garden, especially partially shaded places near fences. In bloom from July 7 until early October.

Eschscholtzias (California Poppies) Hybrids.—Many of the new strains of the Eschscholtzias advertised by many of the seed firms were tested at the Farm during the past summer—amongst these, the new hybrids of recent introduction are particularly pleasing. Many of them in habits of growth, are similar to the regular Eschscholtzias, although in some cases they are very compact or more dwarf in form. As a rule they attain about one foot in height. It is to be expected that, following the introduction of many shades of pink and duplex designs of colour in this easily grown flower, it will attain a much greater degree of popularity during the next few years. In bloom from August 3 till end of October.

Mesembryanthemum tricolor (Fig. Marigold).—A dainty little plant growing about 3 inches high, and very suitable for rock work. It is well adapted for sunny situations and produces crimson and white flowers with a dark centre which, although not large, are quite attractive. In bloom from July 10 till middle of October.

Sedum caeruleum (Stonecrop).—A pretty little rock plant growing about 3 inches high. Flowers pale blue. In bloom from July 26 until middle of October.

Tagetes signata pumila (Dwarf Marigold).—This is a little plant growing about 9 inches high and produces throughout the whole season abundance of orange yellow

flowers. This variety is evidently exactly the same as that reported on last year under the name of Tagetes Golden Gem. In bloom from July 1 until middle of October.

Viscaria, Blue and White Varieties (Rose of Heaven).—A profuse blooming hardy annual growing about one foot high. This special mixture contains blue and white varieties only, which, although pretty, are not so attractive as the variety Cardinalis reported on last year. In bloom from July 15 until end of September.

Chrysanthemum tricolor (Annual Chrysanthemum).—This is one of the larger growing daisy-like type of chrysanthemum. The plant is somewhat large and spreading and attains a height of about two feet. The flowers are tricolour as suggested by its name, many of them are very attractively and somewhat oddly marked. Quite useful for cutting, and the plant is very suitable for borders. In bloom from July 4 till middle of September.

Chrysanthemum, Morning Star (Annual Chrysanthemum).—This is another chrysanthemum of the same type as the former. The flowers are golden or pale yellow and white, attractive and suitable for cutting. In bloom from July 7 till end of September.

Helianthus Miniature (Sunflower).—Free blooming sunflower, described by the raisers as a miniature type. Height about 4 feet and spreading in habit. Flowers are golden yellow with dark centres single and about 3 inches across—rather useful for cutting, although the plant is perhaps more useful for the back of a border. In bloom from July 1 to middle of October.

Perilla nankinensis, Improved.—This is an improved form of Perilla nankinensis. This plant has an attractive dark purple foliage, and is suitable for borders or bedding purposes. It is useful also for growing in the greenhouse. Many distinct types were noticed from those raised from the same packet of seed. Height about 2 feet.

Mathiola (Stocks, Beauty of Nice).—This variety of ten-weeks stock is of very compact form and free flowering in habit. Height about 2 feet and the colour is a pleasing pink. Amongst the many varieties of stock tested this year, this is one of the best, both for compactness and length of blooming season. In bloom from July 1 to middle of October.

Alyssum Benthamii compactum (Lilac Queen).—This variety was sent out as a novelty by one of the large seed firms. It is very compact in form and continuous in its flowering habit, and desirable for those reasons, but in some cases a few of the plants are not fixed in colour, and present a rather dirty white appearance rather than lilac. In bloom from July 1 until end of October.

Browallia elata (Amethyst Plant).—This is rather a well known plant, which did well grown as an annual. It attained a height of about 18 inches and continued in flower for a long season. Useful for borders. In bloom from July 14 to middle of October.

Chrysanthemum (New Single early flowering hybrid).—This is another novelty sent out by one of the large firms, but from comparative tests it appears to be practically the same as the Japanese chrysanthemums which have been grown for some years past. The plant is in many cases able to survive the winters if planted in a sheltered position. The flowers are single and semi-double and on account of their profusion are not so large as could be desired. In bloom from July 21 until early November.

Chrysanthemum (Northern Star).—This is another novelty sent out for the first time this year, and is similar in all respects except that of colour, which is slightly different to the Morning Star variety mentioned above. In bloom from July 14 until end of September.

Calendula (Pot Marigold).—Several new strains of Calendula were tested this year. The plants are in no way different from those of the ordinary Calendula, although the flowers in many cases are more attractive. Height about 18 inches, flowers produced in great profusion, and very useful for cutting. In bloom from July 3 until end of October.

Centaurea (Moschata roseo) (Sweet Sultan).—This, although sent out as a novelty for the first time this year, is in no way different from Sweet Sultan reported on last year. Centaureas are very useful plants in the border and exceptionally so for cutting purposes, the flowers being produced on long stems and lasting well when cut. These new strains of Centaurea are perhaps among the most useful of all our annual flowers, as they continue in flower and produce abundance of bloom for table decorations late into the month of October.

Lobelia hybrida, Sapphire.—This is a new Lobelia sent out as a novelty this season which has a habit of growth very similar to the Tenuior types. It grows from 9 to 12 inches tall with a somewhat spreading habit. The flowers are extremely attractive, being a brilliant blue with a white centre. It will probably be found that this will be a very popular type for window box work as it is certainly a great addition to the Lobelias. In bloom from July 1st to beginning of October.

Schizanthus grandiflorus maximus (Butterfly Flower).—This variety was sent out as a novelty this season and was grown amongst the other varieties of Schizanthus for comparative test. It did not, however, appear to be any better than many of the regular and older types. July 7 till September 1st.

Antirrhinum, Double White (Snapdragon).—Sent out as a novelty this season. One of the best of the medium height, double white snapdragons. In bloom from July 15 till middle of October.

Stocks (One and All New White).—A good white variety sent out as a novelty this season. Recommended. In bloom from July 14 until end of October.

The following plants were those which in 1914 were considered to be of second-rate, or even less importance when compared with those just listed and the many other well known flowers which were grown in the test plots with them. All plants were grown under uniform conditions and complete notes recorded on the length of their flowering season, height, hardiness, flowering habits, etc.

Adonis aestivalis (Pheasant's Eye).—Pretty, but season of bloom is too short.
Anagallis (Pimpernel).—Of easy culture, but too weedy in appearance.
Asperula azurea setosa (Woodruff).—A rather attractive little plant producing an abundance of blue flowers.
Collomia coccinea.—Is in bloom for a short season only and has no special merit.
Diascia Barbarae.—Rather attractive but does not make any show until too late in the season.
Eutoca viscida.—Produces flowers of a beautiful blue but the plant itself is too weedy in appearance.
Gamolepsis Tagetes.—Early flowering and pretty but season of bloom is over too soon.
Gilia mixed varieties.—Dainty free flowering little plants, suitable for rock gardening.
Hibiscus africanus major.—Individual flowers attractive but do not last. Plants rather unattractive.
Inopsidium acaule.—A neat little dwarf plant for shady places in the rock garden.
Layia elegans (Tidy Tips).—Pretty yellow flowers fringed white, plants dwarf and somewhat spreading.
Limnanthes Douglasii.—Yellow flowers and fragrant. A good flower for the bees.
Loasa aurantiaca.—A trailing plant flowering rather late in the season. No special merits.
Mathiola bicornis.—(Night scented Stock).—Flowers not large enough to be attractive, plants scraggly.
Phacelia campanularia.—Seed should be sown in the open like Poppy seed. Flowers of a very beautiful blue but rather small.
Salvia splendens bicolor.—Not so attractive as the better known scarlet "Fireball" varieties.
Tagetes lucida.—Plant straggly and flowers not attractive.
Xeranthemum, mixed, (Immortelle).—Useful Everlasting annuals, but no effective colours.
Nicotiana sylvestris.—A bold plant five feet high, flowers in spikes. Less attractive than Affinis.
Salvia Blue Beard.—A useful plant for autumn effects.

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A list of annuals which continue in bloom late into the autumn and are recommended for use in perennial borders and for autumn effects:—

Low Growing—
Antirrhinum Dwarf,
Brachycome,
Chrysanthemum Bridal Robe.
Eschscholtzia,
Lobelia tenuior,
Mignonette,
Nemesia,
Tagetes signata pumila,
Verbena.

Medium Height—
Acroclinium,
Antirrhinum,
Alonsoa Warscewiczii,
Annual Chrysanthemum,
Asters.
Calendula,
Gaillardia (Annual),
Linum,
Limnanthes Douglasii,
Petunia,
Phlox Drummondii,
Stocks Ten-Weeks,
Salvia Blue Beard.

Tall—
Cosmos,
Helichrysums,
Helianthus,
Larkspurs, Tall varieties,
Nicotiana,
Sweet Sultan,
Scabiosa,
Salpiglossis.

On October 6, 1914, all of these annuals were still making a good show of flowers and had received no injury from several slight frosts previous to that date.

GOOD ANNUALS TO GROW FOR CUT FLOWERS.

China Asters.
Sweet Peas.
Nasturtiums.
Sweet Sultan (Centaurea).
Pin Cushion Flower (Sweet Scabious.)
Single Collarette Dahlias.
Ten-Weeks Stocks.
Mignonette.
Snapdragons.
Everlastings.
Zinnias.
Calliopsis or Annual Coreopsis.
Gladioli.
Pansies.

USEFUL FERNS, PALMS, AND OTHER EASILY GROWN FOLIAGE PLANTS, FOR HOUSE OR CONSERVATORY.

A large number of inquiries reach the Central Farm with respect to the care of house plants. The following notes on varieties, and suitable care of some of the commoner or easily grown foliage plants, give such information as is generally supplied in answer to many such inquiries.

Ferns.—Ferns grow best in a temperature ranging from 45 to 55 or 60 degrees Fahr. in winter and from 50 to 70 degrees Fahr. in summer. The following are varieties which are most generally grown and do best when grown under house conditions:—

Common Name.	*Botanical Name.*
Sword Ferns and the Boston Ferns	*Nephrolepis* in several varieties and the newer dwarf types such as the Scott fern, also Whitman's and Pierson's plume types.
Maiden-hair Ferns	*Adiantum capillus vernus, Croweanum, formosum* and *pedatum*.
Spider Ferns or Brake	*Pteris cretica, Wilsonii* and others.
Holly Fern	*Cyrtomium falcatum* and *Rochfordianum*.
Male Fern	*Lastrea Filix-Mas*, also varieties of *Lastrea* such as *fragrans, Sieboldii* and *decurrens*.
Hart's Tongue Fern	*Scolopendrium vulgare crispum*.
Lady Fern	*Asplenium Filix-fœmina, lucidum* and *marinum*.
Polypody	*Polypodium vulgare cambricum* and *dryopteris*.
No common name	*Woodwardia radicans*.
" "	*Nephrodium molle*.
" "	*Osmunda japonica* and *palustris*.
" "	*Lomaria alpina* and *chilensis*.
" "	*Polystichum angulare* and *aculeatum*.
" "	*Davallia Mariesii* and others used for fern balls.

Brief Notes on the Care of Ferns.—Ferns grown in the house should be repotted every year or every second year in order to keep them growing healthily. Such repotting should be done in the spring, in either March or April. When repotting remove some of the old fronds (leaves) and some of the soil from the roots. Do not disturb the roots too much. Place some drainage in the new pot in the shape of pieces of broken flower pots or small stones. Add a little soil, but only enough to raise the fern, when replaced in the pot, to its proper height. Then work in some good fibrous loam and leaf mould, using the fingers or a small stick to pack it firmly around the roots. When potting is properly done about an inch of space will be left without soil at the top of the pot. This space is very necessary otherwise it is impossible to water ferns properly.

Watering should be done every day, or every second day. In dry rooms, especially those heated in the winter with hot air or steam, daily watering is frequently necessary. Ferns should not stand in pans of water, but it is a good practice to stand pans of water on the radiator or near the plants in order to keep the atmosphere from becoming too dry. As a rule ferns do not do well in rooms and the main reason is that the air becomes too dry for them, quite unlike that to which they are accustomed in their habitat in shady woods. Draughts and excessive changes of temperature also work injury to the ferns. On the other hand they will be benefited by fresh air from an open window on a warm day, even in winter.

Moisture in the atmosphere of the room, careful and sufficient watering, as even a temperature as possible, and some fresh air, are four points which must not be neglected if ferns are to be grown successfully.

Additional factors which make all the difference between success and failure are, first, with regard to the best time to water. Water in the morning if possible, and water regularly. Should the soil be wet and sodden looking when the watering is done the plants are getting too much water. The remedy is to water every second or third day instead of every day. On the other hand, should the soil be quite dry and hard it is a sign that water is not given often enough. The remedy is to water every day, and apply enough so that it reaches to the bottom of the pot. The second important thing to remember is to choose the right kind of fern. Maiden-hair ferns are not so suitable for dry rooms as the Boston, Brake and other ferns. The leaves of the former are very delicate and wither very soon if they are brought from a moist greenhouse to a room.

In some cases the drying up of the fronds of hardy ferns suggest that they are in need of a rest period similar to that which they have in natural conditions during the winter. Old ferns, in particular, are apt to show such signs. To restore them to vigor and health give them a few months rest in a cool room. Withold water from them, applying it only about once a week, and allow some of the fronds to die off. Then repot in the spring as described above.

A general sickly appearance as well as insect troubles may be caused partly by neglect of the above rules of good culture, and partly by improper soil and lack of ventilation. The best soil for ferns is one made by mixing in about equal parts some good fibrous loam, some leaf mould or peat, and some sand or sandy soil.

Palms.—Palms are not difficult plants for house culture, and the following eight or nine are among the best:—

Thatched-leaf palm	*Kentia Belmoreana.*
Curly palm	*Kentia Fosteriana.*
Feather-leaved palm	*Phœnix Roebelenii* and *sylvestris.*
" "	*Cocos Weddelliana.*
Fan-leaved palm	*Chamerops humilis.*
" "	*Livistona rotundifolia.*
Chinese leaved palm	*Latania Borbonica.*
Australian feather palm	*Seaforthia elegans, Areca lutescens.*

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Palms to do best should be given partial shade in summer, and plenty of water. Under these conditions they will withstand a fairly high temperature, but will do better in a cool room where the temperature does not exceed 65 or 70 degrees. In winter the temperature should average between 45 and 60 degrees and the air should not be allowed to become dry. Moderate watering only should be given in winter and water should never accumulate in the pans or jardinieres in which the pots are placed. Keep the leaves clean by washing with soapy water.

Palms naturally grow very slowly and therefore do not seek to over stimulate or hurry their growth. Repot about once a year when young as for ferns, but after they have attained a good size repotting will not be necessary. When repotting do not disturb the roots, and handle carefully. Use good garden loam together with plenty of drainage material in the bottom of the pot.

Other Foliage Plants.—Of a large number of ornamental plants which are useful to produce pleasing impressions by means of their foliage rather than their flowers, the following are given and briefly described as those which are best suited for culture in the ordinary house.

Flowering plants such as Geraniums, Chrysanthemums, etc., will be dealt with another year, but these foliage plants are added to the Ferns and Palms to make the list of this type as complete as possible.

Ficus elastica (Common Rubber Plant).—A very simple plant to grow and does well in the ordinary house. Perhaps the most popular of all foliage plants for home use. Pot in rich soil and keep well watered; do not water in excess in the winter. May be propagated by "topping" the old plant or by a method of gradually severing the top of the plant so that it forms roots at the cut part.

Pandanus (Screw Pine).—A favourite decorative plant, easily grown. The leaves come out spirally and curve down gracefully. Soil should be of a fairly light type. Give plenty of water in the summer and only a moderate amount in winter. Propagated by suckers from the base of the old plant.

Anthericum variegatum.—An attractive ornamental foliage plant, with strap-like curving leaves striped with white. Propagated by dividing the parent plant. Of easy culture.

Asparagus, Ornamental (Asparagus Fern).—Well known, attractive and of easy culture. Does best in a temperature of 55 to 60 in winter and 60 to 75 in summer. Water liberally. Propagated by seeds or cuttings.

Aspidistra (Parlour Palm).—A plant which will withstand poor conditions better than most plants. The variegated leaved variety is attractive. Propagated by dividing the parent plant in spring.

Begonia, Ornamental-leaved varieties.—Handsome foliage plants requiring fairly warm treatment, with a moderate amount of water in winter and a free supply during the summer. Propagated from leaf cuttings.

Coleus.—Handsome, rapid growing foliage plants of extremely easy culture, but more suited for summer than winter culture. Propagated from cuttings or seed.

Cyperus (Umbrella Plant).—A healthy easily grown plant adapted for room culture. Propagated from seed or by dividing the parent plant.

Dracaena (Cordyline).—Handsome foliage plants, many with coloured leaves. Should be kept shaded from bright sunshine. Does best in warm temperature. Propagated from seed or cuttings.

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Farfugium (Spotted Colt's Foot).—A foliage plant of easy culture with dark green leaves blotched with yellow, white or rose. Does well in shade as well as in the sun. Propagated by division of the plant in the spring.

Funkia (Plantain Lily).—The smaller varieties make very good pot plants. They need rather large pots and should be repotted in March. Water freely from March to October. Propagated by dividing the roots in spring.

Grevillea (Silk-bark Oak).—A plant with fern like foliage of a shrubby nature. Requires careful watering and a good supply of air in summer. Some flowers are produced by several varieties of *Grevillea*. Propagated by seeds and cuttings.

PLANTS SUITABLE FOR ROCK GARDENS.

Hardy at Ottawa.

Anemone sylvestris and *patens Nutalliana.*
Aethionema coridifolium and *grandiflorum.*
Adonis vernalis.
Alyssum saxatile.
Aquilegia chrysantha nana and *olympica nana.*
Arabis albida and *alpina.*
Armeria maritima.
Aster alpinus superbus.
Campanula carpatica, and *Fergusonii.*
Dianthus caesius, deltoides glaucus and *montanus.*
Epimedium alpinum rubrum, and *pinnatum.*
Heuchera brizoides gracillima, sanguinea and *Virginal.*
Iberis sempervirens fl. pl. and Snowflake.
Iris cristata and *verna.*
Mertensia pulmonarioides.
Myosotis alpestris Victoria.
Papaver nudicaule, alpinum, and *umbrosum.*
Pentstemon barbatus (for special effects).
Phlox subulata and *divaricata.*
Primula, hardy hybrids when given slight protection.
Saxifraga ligulata.
Sedum spectabilis.
Sempervivum.
Statice elegans.
Trollius europaeus.
Viola Zovi and others.

Suitable Dwarf Shrubs.

Cytisus purgans and varieties.
Daphne Cneorum.
Kerria japonica variegata (winterkills at tips).

For particulars as to heights, etc., of most of the above, see bulletin No. 5, second series.

TREES AND SHRUBS FOR SANDY SOILS.

Common Names.	Botanical Names.
Trees—	
Manitoba Maple.	*Acer Negundo.*
Birches, White and Paper.	*Betula.*
Honey Locust.	*Gleditschia triacanthos.*
Poplars or Cottonwood.	*Populus.*
Pin and Red Oaks.	*Quercus.*
Willows, several varieties.	*Salix.*
Rock Elm.	*Ulmus racemosa.*
Jack Pine.	*Pinus Banksiana.*
Scotch Pine.	*Pinus sylvestris.*
Small Trees—	
Tartarian Maple.	*Acer tataricum.*
Siberian Pea Tree.	*Caragana arborescens.*
Hawthorn.	*Crataegus.*
Shrubs—	
June Berry.	*Amelanchier.*
False Indigo.	*Amorpha fruticosa.*
Dogwoods.	*Cornus.*
Wolf Willow.	*Elæagnus argentea.*
Sea Buckthorn.	*Hippophæ rhamnoides.*
Matrimony Vine.	*Lycium europæum.*
Shrubby Cinque-foil.	*Potentilla fruticosa.*
Sand Cherry.	*Prunus pumila.*
Buckthorn.	*Rhamnus cathartica.*
Fragrant Sumach.	*Rhus aromatica trilobata.*
Missouri Currant.	*Ribes aureum.*
Buffalo Berry.	*Shepherdia argentea.*
Spiræa, several varieties.	
Snowberry.	*Symphoricarpus.*

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TREES AND SHRUBS FOR SHADY PLACES.

Trees which will succeed in shady places.

DECIDUOUS.—

American Beech
Sugar Maple
Box Elder (Manitoba Maple)
Russian Mulberry
Wild Black Cherry

EVERGREEN.—

Hemlock
Arbor-Vitae
Douglas Fir
Spruce
Japanese Yew.

SHRUBS WHICH WILL SUCCEED IN SHADY PLACES.

Privets of different species *(Ligustrum).*
Viburnum of different species, including Guelder Rose, or High Bush Cranberry.

These are among the best.

Buckthorns.
Dogwoods *(Cornus).*
Deutzia.
Hydrangea arborescens.
Clethra alnifolia.
Witch Hazel.
Oregon Grape *(Berberis Aquifolium).*

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ORNAMENTAL SHRUBS AND TREES PRODUCING SUMMER FRUITS OR WINTER BERRIES, ATTRACTIVE TO BIRDS, AND HARDY AT OTTAWA, CANADA.

Common Name.	Botanical Name.	Best Summer Fruit.	Best for Persistent fruit or Winter berries.
Barberries	*Berberis*	*	*
Mountain Ash	*Sorbus*	*	*
Juneberry	*Amelanchier*	*	*
Hawthorn	*Crataegus*	*	*
Raspberry	*Rubus*	*	*
Purple Flowering and Mountain.			
Blackberries	*Rubus*	*	*
Wild Plum	*Prunus*	*	*
Bird Cherry	*Prunus pennsylvanica*	*	*
Choke Cherry	*Prunus virginiana*	*	*
Sand Cherry	*Prunus pumila*	*	*
Wild Black Cherry	*Prunus serotina*	*	*
Black Alder	*Ilex verticillata*	*	*
Strawberry Bush	*Euonymus*	*	*
Shrubby Bittersweet	*Celastrus scandens*	*	*
Buffalo Berry	*Shepherdia*	*	*
Dogwood	*Cornus*	*	*
Mountain Cranberry	*Vaccinium Vitis-idaea*	*	*
Matrimony vine	*Lycium vulgare*	*	*
Elder	*Sambucus*	*	*
High-bush Cranberry	*Viburnum*	*	*
Sheepberry	*Viburnum Lentago*	*	*
Arrowwood	*Viburnum dentatum*	*	*
Coral Berry	*Symphoricarpus*	*	*
Honeysuckle	*Lonicera*	*	*
Hackberry	*Celtis occidentalis*	*	*
Mulberry	*Morus*	*	*
Canada Moonseed	*Menispermum*	*	*
Inkberry	*Ilex glabra*	*	*
Frost Grape	*Vitis cordifolia*	*	*

SOME USEFUL HINTS FOR ALL PURPOSES.

Although most of the following vines may be used to good effect under many circumstances, they are here classified into six groups to indicate in a simple way which vines are most suitable for certain specific purposes:—

1. *On the House*—
   - Virginian Creeper, self-fastening variety. This is generally catalogued as *Ampelopsis quinquefolia hirsuta* or *Engelmannii*, but these two are distinct.
   - Boston Ivy, where hardy. Does best on north or west side of house.
   - English Ivy " " " " "
   - Trumpet Vine " " " " "
   - Kudzu Vine, where hardy.

2. *For the Verandah or Porch*—
   - Dutchman's Pipe Vine.
   - Climbing Bitter Sweet.
   - Jackman's Large Flowered Clematis.
   - Scarlet Trumpet Honeysuckle.
   - Wistaria, where hardy.

3. *Most suitable for Arches*—
   - Roses—Crimson, Rambler, Dorothy Perkins, American Pillar.
   - *Akebia quinata.*
   - Clematis.

4. *For the Pergola*—
   - Trumpet Vine.
   - *Actinidia arguta.*
   - Wistarias, where hardy.
   - Roses.
   - Wild Grape Vine.

5. *For Fences*—
   - Matrimony Vine.
   - Virgin's Bower (Clematis).
   - Honeysuckles.

6. *For Screens*—
   - Any of the large leaved vines amongst the above are suitable. Also annual vines such as—
     - Tall Growing Nasturtiums.
     - Cup and Saucer Vine.
     - Canary-bird Vine.
     - *Eccremocarpus.*

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PLANT BREEDING.

(A. J. LOGSDAIL, B.S.A., *Assistant in Charge.*)

It was found convenient to divide the report of the work in connection with horticultural plant breeding during the year 1913 into three main divisions, Pomology, Olericulture, and Floriculture. A similar division of the work will be followed for the report of the past year of 1914.

POMOLOGY.

The plant breeding work in Pomology and more particularly that in connection with apples, consisted of the care of the seedling crosses made during former seasons and now growing in the nursery row, and also the securing of further seedlings by making new crosses on the crop of the current year. The object in these crosses was to secure, if possible, a heavy yielding, long keeping apple of good quality, that would begin to bear fruit at an early age, such as the Wealthy or Wagener.

The varieties used in this work included several of the most promising seedlings produced at the Central Experimental Farm together with several well known varieties possessing desirable characteristics. Amongst the most important seedlings employed in this work may be mentioned: Danville (Lawver seedling), Glenton (Northern Spy seedling), Bingo (Northern Spy seedling), Rouleau (Salome seedling), Cobalt (Lawver seedling), Crusoe (Wealthy seedling), Rosalie (Northern Spy seedling), Niobe (Northern Spy seedling).

The season proved to be very favourable for this work and a fairly large percentage of fruit was obtained and the seed from these crosses was sown for spring germination.

The following is a list of the crosses made with apple varieties:—

18·23	Danville F.	x	Wealthy M.
18·24	Glenton F.	x	Wealthy M.
18·25	Rouleau F.	x	Wealthy M.
18·26	Bingo F.	x	Wealthy M.
18·28	Cobalt F.	x	Duchess of Oldenburg M.
18·29	Crusoe F.	x	Cobalt M.
18·31	Crusoe F.	x	Duchess of Oldenburg M.
18·32	Niobe F.	x	Crusoe M.
18·33	Niobe F.	x	Wealthy M.
18·34	Rosalie F.	x	Crusoe M.
18·35	Rosalie F.	x	Wealthy M.
18·36	Wealthy F.	x	McIntosh Red M.
18·37	Wealthy F.	x	Duchess of Oldenburg M.
18·39	McIntosh Red F.	x	Wealthy M.

N.B.—The letter "F" denotes the female parent, or tree upon which the fruit was produced, and the letter "M" denotes the male parent or the tree from which pollen was secured.

PEARS.

The breeding work with pears was a continuation of that inaugurated during the previous season. The object of this work was to secure, if possible, a hardy pear, reasonably blight proof, and of a good edible quality.

The pears Gliva Kurskaya, Zuckerbirn and Lemon Pear are of Russian origin. These pears have proved hardy at Ottawa, have grown vigorously and have suffered but little from blight, whereas the other varieties, consisting of well known commercial sorts, have all been, without exception, either destroyed by the rigours of climate or the ravages of pear blight.

Pollen was secured from the best of our commercial varieties of pears growing in more southerly sections, and was used on the hardy Russian varieties in the Central Experimental Farm orchards. Owing to favourable climatic conditions, we were able to secure a considerably larger amount of seed than was secured during last year on similar work.

The following is a list of crosses made with varieties of pears:—

16·23	Gliva Kurskaya F.	x	Flemish Beauty M.
16·24	Gliva Kurskaya F.	x	Clapp Favourite M.
16·25	Zuckerbirn F.	x	Seckel M.
16·26	Zuckerbirn F.	x	Clapp Favourite M.
16·27	Lemon Pear F.	x	Clapp Favourite M.
16·28	Lemon Pear F.	x	Anjou M.

The fruit from these crosses matured and was collected on August 17, and a few days afterwards the seed was sown for spring germination.

GRAPES.

A quantity of seed of grapes of Labruscan origin, namely, Moore Early, Concord, Worden, Vergennes and Champion, and also seed of the varieties of Hybrid Labruscan and Viniferan origin, namely, Campbell Early, Brighton, Niagara, Salem and Daisy, were sown during the autumn of 1912. The seed germinated to a large extent during the spring of 1913, but further seedlings appeared in the seed beds during the spring of 1914. These young grapes have been transplanted to the nursery row and are now requiring further room. It is the intention to carry on this work with grapes under more favourable circumstances of both soil and climate at the Experimental Station at Lennoxville, in the southern part of Quebec. The seedlings will be planted in the grapery at this Experimental Station in the spring of 1915, and there fruited.

STRAWBERRIES.

Last year a collection was made of native geographical species of strawberries from several localities throughout the Dominion. Wild strawberries were secured from Fredericton, N.B.; Ottawa Valley, Ont.; Niagara District, Ont.; Golden, B.C.; Nelson, B.C., and a species from South Dakota. Besides these, were grown several of our best commercial varieties such as Pocomoke, Williams, Senator Dunlap, William Belt, and Bubach, together with several of the best strawberry seedlings produced at the Central Experimental Farm.

During the past season a number of crosses were made between the native species and the commercial varieties. Following is a list of the crosses made:—

10·31 Fragaria Virginiana (Eastern Ontario) x William Belt.
10·32 Fragaria vesca (Eastern Ontario) x Bubach.
10·33 Portia (William Belt Seedling) x Fragaria Virginiana (South Dakota).
10·34 Fragaria (Golden, B.C.) x Senator Dunlap.
10·35 Valeria (Bubach seedling) x Fragaria Virginiana (Southern Ontario).
10·36 William Belt seedling No. 5 x Fragaria Virginiana (Southern Ontario).

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The seed from these crosses was sown in seed boxes and the plants are now growing freely, and though quite small will be ready for field planting in the spring.

Record should here be made of a wild strawberry received during the past summer from Mr. A. H. Tomlinson, of the Department of Agriculture, British Columbia, which was found by him growing on the Queen Charlotte Islands, longitude 132, latitude 53·4. It is highly spoken of by him as a wild species, and it is hoped that we may be able to use it in our strawberry breeding work.

OLERICULTURE.

VEGETABLES.

The work with vegetables consisted very largely in breeding work with varieties of corn, varieties of peas, beans, and strains of tomato. A little work was carried on with potatoes and preparatory work with onions.

Corn.—During the summers of 1912-13, careful records were made of the merits of several strains of Early Malcolm Sweet Corn, and by eliminating the poorest strains, seed was secured for future work and for distribution to experimenters. The strains that were selected for future work at the close of the season of 1913, were grown (during the past season) in close proximity to each other with the object of crossing the best of them to increase vigour, if possible, and avoid the evil effects of the close inbreeding of corn.

The crop was somewhat earlier than last year, and the seed better matured, but on the average, the yield was not so large, though the quality of the crop showed a slight improvement.

Besides the selection work with these strains of Early Malcolm Sweet Corn, a number of crosses had been made during the season of 1913, and these were grown for the F_1 generation.

The crosses were: Early Adams (dent) x Early Malcolm (sweet); White Squaw (flint) x Early Malcolm (sweet); and Red Squaw (flint) x Early Malcolm (sweet).

In the ears secured from the Early Adams plants that had been pollinated with Early Malcolm and also with the plants of White and Red Squaw, similarly pollinated with Early Malcolm, several forms of ears were clearly noticeable.

In the Early Adams, several ears were found in which about 60 per cent of the kernels appeared like the pure seed of the Early Adams; the remaining 40 per cent of the seed was wrinkled and semi-translucent, a good deal resembling the kernels of Early Malcolm. As all the tassels of the Early Adams plants had been removed no pollen of Early Adams could possibly have been produced. The appearance of these two forms of grain on the one ear was an illustration of the well-known phenomenon "Xenia." Xenia may be thus explained: if, for instance, pollen from a round corn is blown on to a wrinkled or sugar corn, round seeds will be formed amongst the normally wrinkled seeds on the ear growing on the sugar corn plants.

Another form of ear was found more commonly on the plants of Early Adams thus crossed with Early Malcolm. This type of ear represented more or less a blend of the characteristics of the opaque, dented seeds of the Early Adams, and the semi-translucent wrinkled seeds of the Early Malcolm. In these ears possessing the blended characteristics, none of the seed was either dented or wrinkled, but it was clearly semi-translucent and flint in form. It was deemed advisable to sow the several types of seed separately; one ear possessing the two forms of kernels was chosen and the wrinkled grain was sown in isolation, from the dented grain.

A similar amount of seed from one of the ears possessing the blended form of grain was also sown.

The crops during the past season from these three types of seed have been most marked. The wrinkled seed yielded a crop of large uniform ears, only 5 per cent of which were in appearance similar to the Early Adams seed, and 95 per cent had all the characteristics of a true sweet corn. The dented opaque seed yielded the heaviest crop, all were large 12-rowed well-filled ears with 64 per cent of dented seed and 36 per cent of wrinkled or sweet corn seed.

The seed possessing the blended characteristics yielded a very uneven crop, many of the ears being long and 8-rowed, some being short and 14-rowed, the majority varying between 10- and 12-rowed. The grain consisted of 75 per cent of dented or semi-dented seed and 25 per cent of wrinkled sugar seed. The result of this work with the cross, Early Adams (dent) x Early Malcolm (sweet), seemed to be that the wrinkled grain of an ear of corn, showing xenia, will produce in the F_1 generation, progeny almost entirely true to the type of the grain sown, namely, sweet corn.

In the cross between the flint Squaw corn and the sweet Early Malcolm, similar segregation of grain was made, but the results were by no means similar to those obtained with Early Adams. The wrinkled kernels yielded a crop practically half of which consisted of wrinkled seed and half of flint corn seed. There was a slight increase in the proportion of wrinkled grain in the crop from wrinkled seed over that of the other two forms of seed, namely: the entirely opaque and semi-translucent. Whether different results are always to be met with in crossing a dent corn with a sweet to those when crossing a flint corn with a sweet, can only be determined by more work and more data than we now have available. Nevertheless, the work so far has produced a very promising new type of sweet corn and there are further types within sight.

The object of this crossing has been to produce a sweet corn that will combine the potent characteristics of the varieties here mentioned.

Early Malcolm is the earliest sweet corn that has been grown at the Central Experimental Farm, and though only a moderate yielder, it produces a medium sized, fairly uniform ear. The Squaw corn, so called because it was first found in possession of the Mandan Indians of North Dakota, is a dwarf, free stooling variety of flint corn, its most marked characteristic being its ability to grow in cooler temperatures than any other corn. On several occasions when the growing season has been somewhat cooler than usual, the Squaw corn has matured and ripened a full crop of grain in northern localities where the Early Malcolm has been severely checked and has completely failed to mature a crop. This characteristic of hardiness should be of extreme value in the production of early maturing varieties of sweet corn, if it can be transmitted to the new strains produced.

The crosses that have been worked with are as follows:—

25-31—Early Adams F. x Early Malcolm.—(Wrinkled grain in appearance like Malcolm, from an ear of Early Adams.)

25 32—Early Adams F. x Early Malcolm M.—(Dented opaque, seeds like pure Early Adams, from the same ear as 25.31.)

25-33—Early Adams F. x Early Malcolm M.—(Neither dented, opaque or wrinkled, but semi-translucent, and flint in form.)

25 34—Early Adams F. x Early Malcolm M.—(Neither dented, opaque or wrinkled, but semi-translucent, and flint in form, from same ear as 25.33.)

25 35—Early Adams F. x Early Malcolm M.—(The whole ear and kernels appeared as pure Early Adams, dented and opaque.)

25 36—White Squaw F. x Early Malcolm M.—(Seed wrinkled like Malakoff, but grown on an ear of Squaw).

25-37—White Squaw F. x Early Malcolm M.—(Seed flint and opaque like Squaw corn, grown on same ear as 25.36.)

25-38—White Squaw F. x Early Malcolm M.—(Seed semi-translucent, not wrinkled, but like flint in appearance.)

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25·39—White Squaw F. x Early Malcolm M.—(Seed opaque and flint, like pure White Squaw.)

25·41—Red Squaw F. x Early Malcolm M.—(Seed red in colour, but wrinkled like Malakoff, grown on a red Squaw ear.)

25·42—Red Squaw F. x Early Malcolm M.—(Seed red, and opaque and flint in form, like pure red Squaw, from same ear as 25.41.)

25·43—Red Squaw F. x Early Malcolm M.—(Seed like Red Squaw, selected for intensity of colour and size of kernel.)

25·44—Red Squaw F. x Early Malcolm M.—(Seed similar to 25·43.)

With regard to the crosses 25.41 and 25.42, the seed in both instances was red, but the crop produced this year gave in the cross 25·41 33 per cent of red ears and 66 per cent of white ears. The cross 25·42 gave 50 per cent of red ears and 50 per cent of white ears.

Tomatoes.—The plant breeding work during the past season in connection with tomatoes has been the further selection of strains of Alacrity tomato grown at the Farm for some years past. The origin of the Alacrity is the Earliana Tomato, which has been selected for earliness, smoothness, uniformity, and as far as possible, yield.

The object in the selection work is to secure, if possible, a strain of tomato that will produce a large proportion of its crop in the first two weeks of fruiting, and, if possible, practically the whole of its crop within the first month. Several strains of Alacrity have already been secured that are showing a decided tendency towards early fruiting.

Many early varieties of tomatoes produce scattered ripe fruit in small quantities for several weeks prior to the commencement of the real crop, this scattered fruit often comprising less than three per cent of the total crop of the variety, and ripening irregularly during a period of two or three weeks, from late July into early August. If a really early bearing variety could be secured which would yield 20 or 30 per cent of its total crop during this period of the season, it would be a good paying proposition for many localities. If the variety in question produced a relatively light total yield, it would be a better paying proposition than a heavier yielding variety maturing a greater portion of its crop during late August and early September.

During the past season twenty isolated strains of Alacrity were planted, about one-sixtieth of an acre of each. A record of these several strains was carefully kept, and the following table gives the results of these several strains and their relative merit, as compared with the average of the strains as a whole.

STRAINS of Alacrity Tomato.

Record Number.	Date Sown.	Planted Out.	First Picking.	Last Picking.	Crop for First two Weeks.		Percentage of Total Crop.	Total Crop for one Month.		Average of all Strains.	
					Lb.	Oz.		Lb.	Oz.	Lb.	Oz.
23-11	4-4	1-6	August 1....	August 28	12	14	27·5	46	14	190	3
23-12	4-4	1-6	July 29.....	" 28.....	20	8	7·3	278	14	190	3
23-13	4-4	1-6	" 29.	" 28.....	12	1	5·5	219	9	190	3
23-14	4-4	1-6	August 1.....	" 28.....	26	10	11·3	230	7	190	3
23-15	4-4	1-6	July 29.......	" 28.....	20	11	8·7	235	12	190	3
23-21	4-4	1-6	" 29.......	" 28.....	14	7	8·5	171	7	190	3
23-22	4-4	1-6	August 1......	" 28.....	15	10	9·5	164	10	190	3
23-23	4-4	1-6	July 27.	" 27.....	16	15	7·9	232	15	190	3
23-24	4-4	1-6	" 27.......	" 27.....	13	12	6·7	203	4	190	3
23-25	4-4	1-6	" 27. ...	" 27.....	11	2	5·7	193	5	190	3
23-31	5-4	1-6	" 29. ...	" 28.....	13	15	7·7	183	0	190	3
23-32	5-4	1-6	" 27.... .	" 28. ...	12	1	5·8	185	9	190	3
23-33	5-4	1-6	August 1.....	" 28....	11	2	5·2	178	1	190	3
23-34	5-4	1-6	" 1......	" 28.....	6	4	4·9	126	12	190	3
23-35	5-4	1-6	July 27......	" 28.. ..	7	13	4·7	164	13	190	3
23-41	4-4	1-6	" 27.......	" 24. ...	8	1	9·5	84	9	190	3
23-42	4-4	1-6	" 29.....	" 24.....	3	14	4·3	84	4	190	3
23-44	4-4	1-6	" 27......	" 24.....	4	15	7·2	68	15	190	3

Owing to the elimination each season of strains that have not proved equal to or better than the average, the standard of elimination is gradually being raised, and is considerably higher this year than the average during the season of 1913. Nevertheless, there are several strains maintaining the high average throughout, as regards yield, earliness of crop and comparative smoothness of fruit.

A considerable quantity of seed from these strains was saved during the past season for distribution to experimenters. Owing to the favourable reports received from the seed sent out during 1913, it is desired to keep up and extend this work of seed distribution as it is evidently being very favourably received by experimenters and co-operators in this work.

It should be mentioned that this work in connection with seed improvement can be materially assisted by the co-operation of individual experimenters in different localities throughout the Dominion, and our thanks are due to several hundred such experimenters, who have received seed from us during the past two seasons, and have reported on the merits or demerits of the seed sent to them. By the able co-operation of a number of such experimenters, we are able to determine those localities or districts to which seed produced at Ottawa seems more particularly suited. Similarly, we are able to determine those localities where the climatic conditions do not seem to be suitable for seed originated at the Central Experimental Farm.

During the spring of 1914 a large number of samples of corn, tomatoes, and garden peas, comprising in all about 2,000 packets, were sent out to experimenters in all the provinces.

The reports received during the latter part of 1914 and the early portion of 1915 refer to seed tested during the summer of 1914. Of 428 reports 266 consider the seed of first-rate quality, and of economic value; 53 report that they possess better varieties, and 95 report failure due to early autumn frosts or drought.

The following table gives a summary, by provinces, of the reports received with reference to seed of Early Malcolm sweet corn and Alacrity tomato, sent out by the Horticultural Division of the Central Experimental Farm:—

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SUMMARY of Reports received in connection with Seed Distribution, 1914.

SWEET CORN—EARLY MALCOLM.

Provinces.	Good.	Indifferent.	Poor.	Frost	Drought.	Accident.	Total.
Maritime Provinces	19	2	3	0	1	1	26
Quebec	30	0	2	1	2	1	36
Ontario	30	3	2	0	0	1	36
Manitoba	7	1	2	0	2	0	12
Saskatchewan	12	3	4	9	9	2	39
Alberta	18	1	4	3	6	3	35
British Columbia	12	1	1	13	4	1	32
Total	128	11	18	26	24	9	216

TOMATO "ALACRITY."

Provinces.	Good.	Indifferent.	Poor.	Frost	Drought.	Accident.	Total.
Maritime Provinces	16	1	2	2	1	1	23
Quebec	31	2	1	3	1	1	39
Ontario	31	3	5	1	0	0	40
Manitoba	10	0	1	2	0	0	13
Saskatchewan	19	1	1	7	7	1	36
Alberta	18	1	3	5	4	2	33
British Columbia	13	2	1	11	1	0	28
Total	138	10	14	31	14	5	212

MELONS.

During the late spring and early summer, a considerable amount of crossing was successfully undertaken with melons, particularly between the Montreal Market and several of the best of the English greenhouse varieties such as Sutton Superlative, Barnett Hill Favourite and Hero of Lockings. The well-known varieties of Paul Rose, Emerald Gem, Early Hackensack and Rocky Ford were also crossed with the above mentioned English varieties.

Seed of these crosses was saved and sown in the autumn for a greenhouse crop. The germination of the seed from these crosses was most irregular. As the greenhouses were new and the succession of crops not yet worked out satisfactorily, this crop did not receive the attention that it required, and proved a failure in consequence. Similar circumstances injured a crop of tomatoes that it was attempted to grow. The melon plants were the result of the summer season's selection and crossing and had the conditions permitted of their successful growth, the greenhouse crop would have accelerated the work in hand. A melon, to be grown successfully under glass in the fall of the year, should be started at an early date so that the plants will have the advantage of the long and sunny days of the latter part of August and early September.

Fortunately some seed of several of the melon crosses had been saved and this seed has recently been sown for a spring crop under glass. It is hoped that from these crosses some plants may be isolated that may prove of commercial value.

The addition of new greenhouses to the Horticultural Division will be of special assistance to the plant-breeding work. There is no branch of horticultural work where the saving of time is of such vital consequence, and with glass space now available it is hoped that much of the work can be accelerated by growing the first generation of crosses made with certain annual crops during the summer previous and

thereby obtain seed of the second generation for the following summer which of necessity must be grown on a more extensive scale under field conditions.

A crop of sweet corn was grown under glass during the winter months and several crosses were made, the seed which matured satisfactorily will be ready for sowing during the coming season.

GOOSEBERRIES.

No particular line of work has yet been undertaken with gooseberries, but at the Central Experimental Farm there are several hundred gooseberry seedlings under observation and these should fruit during the season of 1915 or 1916 at the latest. These seedlings are in the main from seed of crosses between *Ribes oxyacanthoides,* a smooth berried gooseberry of our native woods and *Ribes Grossularia.* Though nothing worthy of note has yet been seen amongst these plants, the seedlings as a whole have shown wide variations in habit of growth and type and form of variety.

PEAS.

A considerable amount of work has been devoted to garden peas and the results to date as evidenced by carefully collected records show that the attention given to this crop has been fully merited. The work has consisted in isolating strains of several varieties of pea and by the evidence of records of yield and vigour the undesirable plants have been eliminated and the very best have been saved for further work, the progeny of each individual having been carefully isolated so that no intermingling of progeny might occur and thereby destroy the information being collected on the merits of individual strains.

The season of 1914 was an exceptionally good one for garden peas at the Central Experimental Farm. The varieties, moreover, were grown on soil peculiarly adapted to this crop and the general average of improvement over that of the previous season amounted to approximately 45 per cent of the 1914 yield. Several varieties have been grown from year to year without any particular selection except that of securing sound seed for using each season, but this work has been maintained so that it might act as a check on the results being obtained with individual plant selection in the other strains. The average increase in the individual plant selected strains amounted to 88·3 per cent over the returns of the previous season; allowing for a general crop increase of 45 per cent owing to climatic conditions, this still leaves a margin of approximately 43 per cent that can only be accounted for as the result of plant selection. In a few isolated instances the increase was noticeably greater but in these cases was due to one of several causes during the previous season, either seed of poor germinating quality, or insect infestation or accident.

The table given illustrates in a general manner the results obtained.

RECORD of Individual Plant Selections with Garden Peas.

Name of Variety.	Record No.	Crop of Dry Seed 1913.	Individual Plant selected for growing 1914.	Crop of Dry Seed 1914.	Individual Plant selected for growing 1915.
		Oz.		Oz.	
English Wonder........	22.311	19.7	1 plant of 37 pods.....	69	1 plant of 38 pods.
" "	22.312	19.7	1 " 37 " ...	69	1 " 38 "
" "	22.321	20.2	2 " 20 " each.	71	1 " 34 "
" "	22.331	18.0	1 " 21 "	74	1 " 35 "
" "	22.341	19.1	1 " 26 "	80	1 " 36 "
" "	22.351	19.1	2 " 20 and 19 pods each......	78	1 " 43 "
" "	22.354	19.1	2 plants of 20 and 19 pods each..........	78	1 " 34 "
" "	22.361	6.6	1 plant of 25 pods.....	81.5	1 " 42 "
American Wonder...	22.371	18.4	2 plants of 18 and 16 pods.	70	1 " 51 "
" "	22.374	18.4	2 plants of 18 and 16 pods....	70	1 " 41 "
" "	22.381	18.4	2 plants of 13 pods each	59	1 " 29 "
McLean Advancer....	22.411	22.0	1 plant of 41 pods...	88	2 plants of 35 and 30 pods.
" "	22.421	22.0	2 plants of 40 and 27 pods...............	75	1 plant of 64 pods.
" "	22.423	22.0	2 plants of 40 and 27 pods..........	75	1 " 50 "
" "	22.431	17.5	1 plant of 24 pods.....	59	1 " 31 "

RECORD of Yield of Garden Pea Strains.

Name of Variety.	Record No.	Amount Sown.	Yield 1913.	Yield 1914.	Relative Gain or Loss.
		Seeds.	Oz.	Oz.	Per cent.
*Gregory Surprise.......	22.470	500	45 (dry)	91 (dry).	120
* " "	22.471	500	38 "	109 "	187
*Gradus	22.472	500	33 "	92 "	178
* "	22.473	500	46.5 "	90 "	93
*American Wonder......	22.474	500	57 "	121	112
" "	22.475	500	93.5 "	126	34
McLean Advancer........	22.476	500	87.5 "	124	42
" "	22.477	500	86 "	124	44
English Wonder	22.478	500	98	142	45
" "	22.479	500	110	148	34
" "	22.481	500	95	138	45
* Little Marvel...........	22.482	500	14.5	120	828
Stratagem...............	22.483	500	85	128	50
Saxonian	22.484	500	67	97	44
Laxtonian	22.485	500	81	164	
Duke of Albany	22.486	500	132	166	

*1913 Germination poor, the relative gain is therefore too high, the average gain being 42.2 per cent.

POTATOES.

Selection with potatoes has been carried on to a limited extent owing to the lack of ground available for this particular crop. The work has consisted in selecting and isolating strains of the Early Ohio. The result of this work to date has not been encouraging owing to the fact that the district of Ottawa is not suitable for the production of potato seed. Further potato work will be undertaken in districts more suited climatically to the work in hand.

FLORICULTURE.

FLOWERS.

A certain amount of attention has been given to several varieties of flowers, namely Aquilegia, Geraniums, Sweet Peas, and several species of Solanum.

Attempts were made to cross several more or less hardy species of Solanum with Lycopersicum (the commercial tomato). Only in one instance was seed secured and that in the cross *Solanum texanum* x *Lycopersicum* Bonny Best. The seed of this cross is now being grown, and the seedlings bear a strong resemblance to the female parent *Solanum texanum.*

Many beautiful shades of Aquilegia were obtained among the new seedlings, and the only great drawback to this most valuable perennial is its tendency to become biennial. These seedlings will be further cultivated for several seasons with the object of securing from amongst them new strains of a decidedly perennial habit.

At this juncture it might not be out of place to draw attention to the qualities of the Aquilegia as a desirable Canadian national flower. It possesses the essential characteristics of hardiness, vitality, high fecundity, and is aboriginal in origin. Besides these essential characteristics the Aquilegia can be easily grown and will repay for the most meager attention a wealth of flowers in spring and early summer sufficient to change the aspect of many a deserted spot to one of real beauty. The Aquilegia possesses, moreover, flowers ranging in colour from the deepest maroon red through shades of pink, yellow and blue, to deep violet, orange and gold. Few flowers possess so many desirable and artistic characteristics as the Aquilegia, our common Canadian species so often found in woods has flowers exhibiting a beautiful combination of red and gold.

Some years ago several crosses were made with sweet peas with the object of ascertaining if possible the relative influence or predominance of colour of the parents in the offspring of succeeding generations. Owing to circumstances it was impossible to grow a sufficiently large number of the seedlings to throw much light upon this question, but from the progeny several worthy types have been secured and further selection work is being carried on.

The cross Countess Spencer and White Spencer in the F_1 generation gave only pinks resembling Countess Spencer, the F_2 yielded 4 whites, 2 creams, 3 cream pinks, 12 light pinks, and 2 salmon pinks.

The cross White Spencer (white) x Black Knight (deep maroon) yielded in the F_1 generation a type of flower resembling a somewhat faded Black Knight, showing nevertheless in the petals a tendency to segregate the colours purplish blue and purplish red. The F_2 generation yielded 4 whites, 4 light lavenders, 1 light pink, 2 maroon and blue, 6 deep maroon. Two of the light lavenders possessed a peculiarly compact habit of growth, to which characteristic they bred true. Nothing was obtained from this cross equal in either form or colour to the parents.

The cross Phyllis Unwin (red) x Lady Grisel Hamilton (lavender) yielded in the F_1 generation a purple and lavender blue picotee distinctly smaller than either parent. The F_2 yielded 1 pure white, 1 cream, 3 pink tinted whites, 6 light blues or lavenders, 2 marbled lavender and purple, 2 purple pinks. In the succeeding generation, namely that of F_3, the majority of the lavender blues and purples showed a tendency in the petals to "marbling" or segregation of these two colours.

A number of crosses have recently been made between several of the excellent new single types of geraniums with the hope of adding to the types now in existence of these deservedly popular forms and colours.

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METHODS ADOPTED IN HORTICULTURAL PLANT BREEDING.

In the production of new varieties the most necessary requisite factors may be said to consist of a certain amount of skill, larger amounts of care and patience, and an unlimited supply of hope and confidence combined.

In the average, the production of each new variety of real value necessitates the testing under similar conditions of hundreds of worthless individuals.

New varieties are very largely produced from seed, and the seed is the product resulting from a union of the male organs of a flower with the female organs. The process is analogous though not physically similar to that of animals. The majority of our commoner and most generally known flowers possess in each individual flower, both male and female organs, the female portion being known as the "pistil" and the male portion as the "anther." The pistil is connected directly with the undeveloped seed or fruit at the base of the flower, the anther or anthers, as there are usually several of them, surround the pistil, and these anthers produce the yellow powdery substance known as pollen. The pollen consists of the spores or male seed distributed from the male organs or anthers. This pollen reaches the sticky end of the pistil and there nourished by the juice secreted by the pistil it germinates and sends down a very minute tube through one of the numerous channels within the pistil to the undeveloped seed cell or ovule at the base of the flower, and by this means the contents of the pollen grain is enabled to reach and combine with the contents of the undeveloped seed or ovule.

It will thus be seen that to produce a cross, one has "only" to prevent the pollen from all sources reaching the flower in question, except the pollen of the flower that has been selected as the male parent of the new cross.

The process of crossing two flowers is quite simple, but there are a number of precautionary measures necessary, so that one may be reasonably certain that the resulting fruit is actually the product of the cross made with the flowers selected, and not the result of fertilization by some other unexpected means.

The principal factors or influences to be reckoned with in this kind of work may be classified under two headings; namely those against which preventive measures must be taken to ensure accuracy of work, and those which tend to assist the natural process of fertilization. This classification has been made merely for the purpose of more easily describing the relative factors bearing on this work. Under the heading of "preventive influences" one can discern the action of certain factors thus classified that might equally readily be included under the heading "Assistive Influences." Under the heading of "Preventive Influences" there may be cited the following:—

(1) *Self Fertilization* or the liability of many flowers to fertilize themselves with their own pollen, such as Sweet Peas and Legumes generally. Self-fertilization sometimes occurs before the flowers have opened their petals.

(2) *Cross Fertilization* by means of pollen from other flowers carried through the agency of the wind. This is most commonly the case with so called anemophilous flowers such as Maize, Grasses, many Nettles, Meadow Rue, etc.

(3) *Cross Fertilization* by means of pollen from other flowers carried by insects. The great majority of our coloured and scented flowers are thus fertilized and are termed entomophilous flowers.

(4) *Cross Fertilization* by means of pollen from other flowers carried through the agency of water. Flowers that are strictly hydrophilous or dependent on water to carry their pollen are not numerous and comprise several species of water lilies, anthuriums and caladiums, but water is often the accidental agency in carrying pollen for some of our entomophilous and anemophilous flowers.

(5) The *Cross Fertilization* of flowers by means of birds. These "ornithophilous" flowers are usually very vividly coloured, and grow in Tropic or Sub-tropic regions. In

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the old world the so called sun-birds of the family of cinnyridae, and in the new world the humming bird family are chiefly instrumental in crossing these ornithophilous flowers.

There are also a number of minor agencies that should be guarded against when they appear. Attacks from pollen eating insects as thrips, sometimes occur. Consanguinity is often noted as a cause of partial or even complete sterility, and the consequent failure to obtain seed. By the terms consanguinity is meant, close or rather very close relationship, resulting from selection and inbreeding carried to excess.

Now to deal with the factors or influences that tend to assist the work of fertilization. I mention first, *Botanical Relationship* in contrast to the factor of consanguinity just dealt with. Varieties of the same species generally intercross quite readily, and are often greatly benefited by the infusion of "new blood" obtained in the nature of pollen from another variety. Different species of the same genus will often cross but there are nevertheless numerous exceptions. Plants of different genera rarely cross, thus it will be seen that botanical relationship, or structural similarity at one end and consanguinity at the other, control the limits of our creative ability or imagination. Secondly one must arrange to cross varieties that blossom at the same season of the year. This limitation may be overcome by several expedients, namely, by forcing plants prematurely into bloom; by arranging dates of sowing the seed so that flowers will be produced simultaneously, or by saving and thoroughly drying pollen, which may be kept for a limited time to fertilize flowers of a later blossoming variety with one of an earlier season. The best results are obtained where the pollen can be taken from a fully matured flower of the selected male parent, and placed immediately upon the pistil of a fully developed flower of the selected female parent. The pollen of certain plants, corn for example, cannot be dried and stored as it loses its vitality very rapidly, usually a period of less than three days being sufficient to totally destroy it, whereas the pollen of certain pomaceous fruits can be successfully stored for several months.

Successful hybridization can only be carried on under favourable climatic conditions. The organic or sex portions of flowers are more easily damaged by extremes of cold or heat than are the asexual portions such as the petals or sepals. A warm somewhat moist atmosphere is the most suitable for the fertilization of blossoms and the consequent setting of fruit.

One must consider the relative physical proportions of the two plants which it is desired to cross. The pollen from varieties possessing small flowers will often successfully fertilize the pistil of a much larger flower, the disproportion in size in this case being chiefly in the comparative proportions of the floral envelope (petals and sepals) of the one flower with that of the other: the comparative proportions of the sexual organs of each parent being much more nearly allied to each other. Sometimes, however, instances are met with where the flowers structurally are very similar, where their "botanical relationship" is that of sub-species, and where everything would suggest that a cross might reasonably be secured yet, despite hundreds of attempts, no success has been obtained. It was later found out that the flowers of the plant chosen for the male parent possessed only short pistils whereas those of the female plant possessed long pistils. The pollen of the former species was able to fertilize the ovules or undeveloped seed sacs of its own species, but would not reach the ovules of the species chosen as the female parent. To overcome this physical disproportion the same species may be used but the sexuality of each changed, so that pollen secured from the species possessing the long pistil may be placed upon the short pistiled flowers of the other plant; by this transposition fertilization may be more readily secured.

It may be now asked how it is possible to guard against the contingencies of the first class and avail oneself of the advantages of those of the second.

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In the first place, namely to prevent self-pollination, the flowers are chosen while yet in bud and just prior to opening, and are emasculated by carefully opening them and removing all the anthers by means of a fine pair of forceps or scissors. The flowers thus emasculated are placed in paper bags so that when they open they will not be visited by insects that have been roaming amongst other flowers and are covered with a variety of foreign pollen.

The paper bags must be large enough to prevent any possibility of the flowers being crushed, but if too big the bags will be severely battered by wind and rain. A good rule is to use the smallest bag that will just cover the blossoms without crushing and yet large enough to be securely tied to the twig. In tying bags around the flowers the bags should be carefully drawn together and then firmly but not tightly tied, for if the pressure of the string is too great, the blossoms within the bag will fall and the work spent on them be lost. When a sufficient number of flowers have been emasculated and bagged they may then be left for a few days to reach maturity. In the meantime it will be necessary to cover with bags a number of flowers on the tree or plant that has been chosen as the male parent. These flowers on the male parent must not be emasculated as it is the development of the male organs or anthers that will supply the pollen for crossing on to the flowers that have been emasculated on the female flower.

The flowers that have been emasculated and bagged will usually mature a day or two days earlier than the remaining flowers on the same tree that have been allowed to develop normally; therefore before the tree is in full bloom it is advisable to open several of the bags and ascertain whether the emasculated flowers are fully matured and ready for crossing. The blossoms when ready for crossing are wide open, and with the aid of a small magnifying glass one can often discern a sticky secretion on the stigma or receptive head of the pistil. The stigmas of different flowers vary much in shape; in the Plum and Cherry and in numerous herbs such as Primula, Petunia, Salpiglossis, and Nicotiana, the pistil resembles a pin and the stigma the pin's head. In the apple and pear and other allied plants, the pistil divides radially into five curved and hairy threads. The stem or style of the pistil is united for more than half its length when it then divides into the five (sometimes four or even six) threads just mentioned.

In many cases what is commonly regarded as a single flower is really an aggregation of several, or many; and these compound flowers as they are called, are to be met with amongst some of our commonest and most generally known flowers and weeds. In this case the many little flowers growing on a common base or receptacle must be studied individually and in crossing varieties that possess such compound flowers the work must entail isolation and emasculation of each individual flower in this aggregate mass. This work is often quite difficult to successfully accomplish, and a beginner who is desirous of keeping an accurate record of the work is not recommended to begin on these compound composite flowers. Some well known examples of these compound flowers are: Dandelions (*Taraxacum officinale*), Groundsel (*Senecio vulgaris*), Sunflower (*Helianthus annuus*), and Daisy (*Bellis perennis*).

When the blossoms are ready for crossing collect the flowers that have been selected and covered for pollen bearers. With a fine pair of tweezers or needles remove the yellow anthers. This operation should be done so that the anthers may drop on to a sheet of smooth glazed paper from which they are easily collected.

When the anthers have been collected from a score or more of blossoms, they should be placed in a dry warm room (that is if circumstances or climatic conditions do not permit of their immediate use), and here allowed to dry thoroughly. When the anthers have thoroughly dried up they will have shed all the pollen they contained. This may now be placed in a clean, dry glass bottle or vial and securely corked. In the case of apple, pear, and plum pollen, if kept in a dry, dark place and only brought

to the light for occasional use or observation, this pollen may be kept for a number of weeks and still retain its vitality.

Pear pollen was secured in this manner by cutting small branches from a dormant orchard during the latter part of February. These twigs were gradually forced into bloom and the pollen produced was saved and thoroughly dried. This pollen was used upon pear blossoms that had developed naturally in the orchard, and were emasculated while yet in the bud stage. The crosses with this stored pollen and the results obtained were as follows:—

Date.	Female Parent or Tree.	Pollen Parent.	Age of Pollen.	Fruits.	Seeds.
May 10	Kurskaya	Zuckerbirn	March 4	8	None.
May 8	Kurskaya	Zuckerbirn	April 9	7	None.
May 9	Kurskaya	Lemon Pear	March 4	21	(Six, semi-developed)
May 9	Lemon Pear	Kurskaya	March 5	0	None.
May 8	Zuckerbirn	Kurskaya	April 9	12	(Ten, semi-developed)
May 8	Clairgeau	Kurskaya	May 7	10	Plump seeds.
May 9	Clairgeau	Kurskaya	May 7	17	Forty-two (32 plump)

In the above record it will be noticed that the pollen used in three instances was nine weeks old, and this pollen was secured from twigs that had been cut from dormant trees just a month earlier. This pollen produced in three trials, twenty-nine fruits containing altogether six semi-developed seeds. (With regard to the relatively poor development of seed it may be stated that the Russian varieties of pear used in this experiment are under normal orchard conditions noticeably deficient in the development of seed in normal average-sized fruits.)

The pollen secured on April 9, or a little over four weeks old, produced in two trials nineteen fruits containing altogether ten semi-developed seeds. The pear pollen secured on May 7, and used two days later, produced in two trials twenty-seven fruits containing forty-two plump seeds and ten semi-developed. This tends to show that although pear pollen is able to retain a certain amount of vitality for several weeks, it is as might be expected more potent in a fresh state.

Mr. Cecil H. Hooper, M.R.A.C., who has worked quite extensively upon the question of the vitality of pollen, says in the Royal Horticultural Society's Journal of November, 1912 (page 247): "Apple pollen was found to germinate after six months when kept in a dry place at a temperature of between 50° and 65° Fahr. The length of time that plum pollen retained vitality was less, but generally it would seem that pollen can be safely transported and kept for some time without any very noticeable effect upon its germination." Mr. Hooper further adds, "that under favourable conditions it was found to take from nine to thirty-two hours for the pollen tube of apples, plums, and cherries to reach the ovary when placed on the stigma or in germinating medium. Cherry pollen required a little over twelve hours."

The equipment that is necessary to carry on this work is both simple and inexpensive. All that is needed is a narrow bladed, sharp pointed pair of scissors, a pair of small forceps, two needle holders fitted with moderately stout needles, a scalpel, and a small camel's hair brush. With these few simple instruments it is possible to conveniently work with a great variety of our flowers and vegetables. A very convenient method of securing the necessary instruments for this work is by buying a set of dissecting instruments in small folding case at a moderate price, as arranged by many of the instrument manufacturers for elementary dissecting work in school and college laboratories. These sets vary in price from $1.50 to $8, but a set costing $2 to $3 will be found to contain all the above-mentioned instruments.

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Thin manilla paper bags are required for covering the flowers that have been emasculated and crossed; the most convenient sizes are perhaps the one-pound and the half-pound bags. Small tags for recording the nature of the cross that has been made and also for the purpose of marking the actual cluster of flowers that were worked upon are required.

Thin manilla paper bags are required for covering the flowers that have been emas- or stiff paper, with a short piece of fine cord or string attached to each, will be found to be the most satisfactory. When a flower or several flowers have been crossed with pollen from another variety the cross that has been made should immediately be recorded on a tag and the tag fastened to the flower spike. The rapid growth of plants at this season of the year makes it necessary to attach a label quite distinctly to each flower spike crossed, because in the course of a few weeks one is generally unable to identify the particular flower cluster that was crossed from among the number that have since been produced.

In recording a cross it is generally the custom to write the name of the female parent (or plant upon which the cross was made) first, and the male parent second. Thus if the variety of tomato known as Earliana has been used as the female parent and has been crossed with pollen from the variety known as Chalk Jewel, the cross would be written Earliana x Chalk Jewel. The sign after Earliana (a circle with a pendent cross) denotes the female sex, and the sign following Chalk Jewel (a circle with an arrow erect) denotes the male sex. On the other side of the label or in the notebook in which a record is kept of the crosses that have been made, it is also advisable to record the date and climatic conditions. Such as (10/5/14) hot, which would denote that the cross was made on the 10th day of May (the fifth month), 1914, and the day was hot.

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EXPERIMENTAL STATION FOR PRINCE EDWARD ISLAND.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

Good progress was made with the horticultural work at the Station in 1914. A part of the property that had been under lease to Mr. G. Albert Mutch became available and was used for garden purposes. A wide border of perennial flowers along the Mount Edward road added greatly to the appearance of the Station grounds. The flowers were quite an improvement over former years, and the second annual flower show held by the Floral Association of Prince Edward Island in August gave every evidence that the interest in beautifying the homes of the province is increasing rapidly. The vegetables and fruits gave satisfactory returns. Insect and fungous pests were apparently more numerous and caused greater damage than usual.

SEASONAL NOTES.

Heavy snow that lay on the ground the greater part of the winter of 1913-14 gave protection to many of the shrubs and plants during the extremely cold weather of February. The spring of 1914 was very backward. Many shade and fruit trees were broken by an ice storm on April 21. There was sleighing on May 2, and a light fall of snow as late as May 11. This was followed by favourable weather, and the trees appeared green on May 28. The cold nights and frequent showers of rain during June delayed all vegetation. Frost was reported in sections of the province on the night of July 1. The strawberry and currant bloom was injured by frost and the fruit was late in ripening. July was cool and dull, so that the abundant rainfall of June was available for the plants during the splendid growing month of August. The first and third weeks of September gave the hottest weather of the summer and ripened up the fruit and vegetables quickly. October and November were very fine. Scarcely enough rain fell for fall ploughing.

Ploughing continued up to December 5, and winter began on December 22, and we had not only snow but extremely low temperatures for Christmas. The winter of 1914-15 was mild with but two exceptions, the one already mentioned and another cold spell about February 1. Quite a little snow lay on the ground late in March, which was a great benefit to many plants, as scarcely any spring heaving has been observed.

METEOROLOGICAL RECORDS.

The mean monthly temperatures, rainfall and hours of sunshine recorded at the Charlottetown Station for the year ending March 31, 1915, were as follows:—

—	Mean average Temperature.	Rainfall.	Sunshine.
	°	Inches.	Hours.
April	32·66	3·78	194·9
May	48·518	2·05	191·4
June	54·741	5·32	247·7
July	63·201	2·84	277·9
August	64·000	2·43	247·9
September	59·016	5·02	191·0
October	47·823	3·57	135·9*
November	35·284	2·65	96·5
December	22·709	2·02	99·9
January	21·55	5·32	72·4
February	22·624	2·34	94·6
March	25·774	2·35	86·4
Total annual		39·69	1,936·5

AREA DEVOTED TO HORTICULTURE.

Two acres were added to the horticultural area during the year, making a total, with wood lots and avenues, of 24 acres.

The wood lots and borders of trees were given a thorough cleaning up and are now very attractive to visitors and the Farmers' Institute Excursions that come to the Station during the hot weather. The beautiful white birch trees which are everywhere, were greatly admired throughout the year.

LARGE FRUITS.

APPLES.

One apple was borne in the apple orchard set in 1910. The trees were sprayed regularly with a power sprayer and made very satisfactory growth. A few dead trees were replaced. In the old orchard the fruit was clean and free from codling moth. Only a medium crop was harvested.

CHERRIES.

The cherry trees were again loaded with bloom and there was a fair set of fruit. The birds proved very destructive to this fruit.

PLUMS.

The spraying kept the plum trees free from disease. Not a single black knot has been found so far in the orchard since it was set in 1910. The following varieties bore fruit:—

Name.	Amount.	Date ripe.	Uniformity.
	Gal.		
Grand Duke	$1\frac{1}{4}$	Oct. 13	Uniform.
Reine Claude	$1\frac{1}{4}$	" 13	"
Saunders	$1\frac{1}{4}$	Sept. 24	Medium.
Smith Orleans	$\frac{3}{4}$	Oct. 10	Uniform.
McLaughlin	$\frac{3}{4}$	Sept. 24	"
Dow	$\frac{5}{8}$	Oct. 13	Medium.
Purple Egg	$\frac{3}{8}$	" 7	Uniform.
Monarch	$\frac{1}{4}$	" 7	"

PEARS.

The pear trees set in 1910 are clean and healthy and made very strong growth. The following trees have borne fruit:—

Name.	Amount.	Date ripe.	Size.
	Gal.		
Lucrative	$\frac{3}{8}$	Oct. 7	Large.
Duchess	$\frac{1}{4}$	" 7	Not uniform.
Flemish Beauty	$\frac{1}{4}$	" 7	Large.
Lawrence	$\frac{1}{4}$	" 7	Medium.

SMALL FRUITS.

GRAPES.

The very late spring kept the grapes quite late in starting growth. The amount of fruit was not so large as in the previous year; however, a fair crop ripened on Winchell and Moyer. Peabody, Delaware and Golden Drop were ripened by tying paper bags over the clusters. The other varieties tested that did not ripen were: Brant, Brighton, Canada, Daisy, Lindley, Manito, Moore Diamond, Moore Early, Worden and Wilder.

CURRANTS.

The crop of currants was much lighter than the previous year, due apparently to the bushes being heaved out of the ground somewhat by the frost. The currant worm was quite numerous on the red and white varieties. These were killed with hellebore. The following varieties did best:—

(Black) Ontario, Saunders and Kentish Hero.

(Red) Moore Seedling, Knight, Large Red and Early Scarlet.

(White) White Grape, Kaiser, and Large White.

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GOOSEBERRIES.

Keepsake, Crown Bob, and Industry gave the best returns among the gooseberries, which were a light crop in 1914.

RASPBERRIES.

Shaffer (Purple) gave the highest yield. Loudon and Herbert (Red) gave very satisfactory yields. Cuthbert winter killed badly the previous winter but made a strong growth of young shoots. Golden Queen (White) gave a comparatively small yield, but produced fruit for a very long period.

STRAWBERRIES.

Twelve seedling varieties were received from Ottawa and planted in May. A new plantation of the different varieties that have been under test at this Station was set out in May. Late frosts destroyed quite a little bloom, and the yields for 1914 were not high. Twenty-seven varieties were tested. The first fruit was ripe on July 10, and pickings continued until the 13th of August. The following varieties are named in order of yield: Bisel, Haverland, Bederwood, Warfield, Bubach. A number of varieties were grown in matted rows. These gave larger returns per acre than those in single rows. Bederwood led the list of varieties in double rows. Others in order of yield were: Parker Earle, Fountain, President, Splendid, Parson Beauty.

TREES AND SHRUBS.

The splendid collection of trees and shrubs on the lawns and along the driveways about the Station grew well and produced much bloom throughout the season. The area about the lily pond was levelled, seeded down, and a few trees planted. A hedge of Spiraea was planted along the cross-road to St. Avards, and the front lawn was divided from the orchard by a hedge of *Berberis Thunbergii*. The following trial hedges were added to the group already at the Station: *Rhamnus cathartica, Hamamelis virginica*, and *Rosa rubrifolia*.

VEGETABLES.

One hundred and ninety-three plots of vegetables were tested in 1914. A new piece of ground that had been in potatoes and strawberries for several years was used for many of these. This land was afterwards found to be thoroughly infested with Club-root, which caused much injury to cabbage, cauliflower and turnips.

The Carrot Rust Fly again attacked the carrot crop. The use of tobacco water applied to the young plants held the pest well in check.

ASPARAGUS.

The bed of asparagus did not winter well, asparagus rust was present and the crop did not come up to expectations.

CHARLOTTETOWN.

BEETS.

Seven varieties of beets were sown May 16, in rows thirty feet long and thirty inches apart. The beets were thinned to four inches apart. The following is the record of the different varieties.:—

Name.	Fit for use.	Shape.	Quality.	Yield per acre.	
				Bush.	Lb.
Cardinal Globe	Aug. 1	Globe	Good	352	38
Early Blood Red Turnip	" 5	Turnip	"	209	52
New Meteor	" 1	"	"	195	00
Eclipse	" 1	Pointed	"	192	54
Egytian Dark Red	" 1	Turnip	"	185	19
Ruby Dulcet	" 1	Round	"	172	21
New Early Black Red Ball	" 1	Ball	"	168	2

BEANS.

The beans matured well during the late dry autumn. There was much less anthracnose than in former years. The following varieties are named in the order of merit:—Golden Wax, Valentine Wax, Refugee, Rustless Wax.

CABBAGE.

Owing to the serious injury to the cabbage caused by Club-root, the data regarding cabbage for 1914 is of little value. We can say that Fottler Improved Brunswick withstood the disease better than any other late cabbage, while Flat Swedish seemed to have the strongest resistance among the early cabbages.

CAULIFLOWER.

The cauliflower although attacked by Club-root produced many fine heads. The Danish Giant Dryweather was the best recorded.

CUCUMBERS.

Five varieties were planted on May 29 in hills 6 feet by 6 feet each way, three hills to each variety. The data are given in the following table:—

Name.	Fit for use.	Yield per acre.	
		Tons	Lb.
Extra Early Russian	August 29	4	323
Cool and Crisp	" 29	3	940
Peerless or Improved White Spine	" 28	3	236
Prize Pickling	October 2	2	626
Giant Pera	" 26	2	325

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CORN.

Thirteen varieties of corn were planted on May 29 in loose sandy loam soil in hills 3 feet apart each way. There were twelve hills of each variety. The corn was pulled when ready for the table. The following gives the details of the experiment:—

Name.	Date of planting.	Date ready for use.	Yield of plot.
Pocahontas	May 29	September 10	96 ears.
Early Fordhook	" 29	" 19	85 "
Perkins Extra Early Market	" 29	" 18	80 "
Metropolitan	" 29	" 30	79 "
Early Dawn	" 29	" 10	77 "
Golden Bantam	" 29	" 26	75 "
Early Iowa	" 29	" 10	63 "
Black Mexican	" 29	October 8	63 "
Extra Early Adams	" 29	September 19	58 "
Early Malcolm	" 29	" 19	52 "
Early Evergreen	" 29	October 3	26 "
Stowell Evergreen	" 29	Did not mature.	
Country Gentleman	" 29	" "	

EGG PLANT.

The egg plant did not mature.

CITRON.

Only two citrons grew large enough for use.

LETTUCE.

All varieties of lettuce did well. They were planted in the open on May 1, and were ready for use on July 14. The following varieties are named in order of merit: Iceberg, Dreer All-heart, Grand Rapids, and Dark Green Capucine.

MUSKMELON.

The muskmelons did not mature.

PUMPKIN.

Two varieties of pumpkin were transplanted on June 16. Earliest variety, gave a large yield of pumpkins of good quality. Connecticut Field produced a fair number of medium-sized pumpkins.

ONIONS.

Considerable injury was done to the onions by the Onion Maggot which thinned the plants out greatly during the summer. The three best varieties in order were: Large Red Wethersfield, Red Globe and White Globe.

PARSLEY.

The Double Curled parsley gave very good satisfaction. Part of this was lifted from the field with the clay on the roots and placed in the cellar where it kept until spring.

PARSNIP.

The Intermediate and the Improved Hollow Crown both gave good yields.

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PEPPER.

The peppers were just left in the hot-bed and when cold weather came in the autumn they were protected again with glass. In this way we secured very fine peppers from the three best varieties which in order of yield were: New Neapolitan, Red Chili and Long Red Cayenne.

PEAS.

Fifteen varieties of peas were planted on May 12 in rows thirty feet long and three feet apart, seed planted one inch apart in the rows.

One half of each was picked for green peas and the other half allowed to ripen for seed. The following is the record kept of the results:—

Name.	Ready for use.	Amount picked green.	Amount ripe clean shelled peas.
		Lb.	Lb.
Telephone	July 29	12½	5⅓
Thomas Laxton	" 20	20	2½
Juno	Aug 7	8	4¼
Gradus	July 20	7½	2
Dainty Duchess	Aug. 4	7	5
McLean Advancer	July 23	6½	2½
Heroine	Aug. 4	6	1¼
Early Giant	July 20	6	1½
Quite Content	" 29	4	2½
Gregory Surprise	" 20	3¼	3
Stratagem	Aug. 1	3	2
Sutton Excelsior	July 21	3	Destroyed by insects.
The Lincoln		½	½
American Wonder		Destroyed by insects.	Destroyed by insects.
Premium Gem		" "	" "

RADISHES.

The two varieties of radishes were first sown on May 18, and then from time to time throughout the season. The Turnip Early Scarlet White Tip was considered superior to the Forcing Turnip Scarlet.

SQUASH.

Ten varieties of squash were planted on May 4. Three hills of each variety were planted 9 feet apart each way. The vines grew very strong and though the yields were not so great as the previous year yet most of the varieties gave good returns. The following are the records that were kept:—

Name.	Fit for use.	Size.	Date of harvesting.	Yield per plot.
				Lb.
Long Vegetable Marrow	Sept. 9	Large	Oct. 9	206½
Mammoth Whale	Aug. 27	"	" 9	187
Hubbard	" 27	Medium	" 9	143½
Golden Hubbard	" 30	"	" 9	120
Delicious	" 27	"	" 9	99
Crookneck	" 27	Small	" 9	57½
Custard Marrow, scalloped	" 20	Medium	" 9	35
Long White Bush Marrow	" 20	Large	" 9	27½
White Congo	Did not	mature.		
Delicata	Aug. 20	Small	" 9	44½

In order of merit, regarding quality, we placed the squash, Hubbard, Golden Hubbard and Delicious.

CHARLOTTETOWN.

TURNIPS.

Owing to Club-root the records of the three varieties of turnips are not reliable.

TOMATOES.

Eight varieties of tomatoes were grown on land that proved to be late and it was so located that there was not sufficient sun reached the vines to ripen much of the fruit. Five plants of each variety were planted four feet apart each way, and the following records were obtained:—

Name.	Date sown.	Date ripe.	Yield of plot.
			Lb.
Extremely Early I.X.L	April 24	Sept. 21	55½
Prosperity	" 24	Oct. 8	25¾
Florida Special	" 24	" 8	23¼
Sunnybrook Strain Earliana	" 24	" 8	22¼
Chalk Early Jewel	" 24	" 8	13¾
Rennie XXX, Earliest Round Scarlet Skin	" 24	" 8	13¾
Line Bred Northern Adirondack, Grade No. 1	" 24	" 8	13
Johnson Jack Rose	" 24	" 8	7¼

POTATOES.

No blight was observed. The yield per acre was computed from the weight of one row 66 feet long. Rows were 30 inches apart and plants 14 inches apart in the rows. All seed potatoes were soaked in a formalin solution before planting.

TEST of Varieties. Planted May 21, dug October 3, 1914. Plots, 1/264 of an acre.

No.	Name.	Form and Colour.	Yield per acre sound.		Marketable.		Unmarketable.	
			Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1	Selina Burbank	Long White	611	36	510	24	101	12
2	Table Talk	Oval "	598	24	510	24	88	00
3	Late Puritan	Long "	576	24	521	24	55	00
4	Wee McGregor	Round "	541	12	426	48	114	24
5	McIntyre	Long Blue	528	00	475	12	52	48
6	Dreer Standard	Long White	519	12	448	48	70	24
7	Lion Paw	Oval White	510	24	446	28	83	36
8	Early White Rose	Long "	501	36	343	12	158	24
9	Early Rose	Oval Pink	479	36	374	00	105	36
10	Empire State	Long White	468	36	371	48	96	48
11	Bliss Triumph	Round Red	453	12	308	00	145	12
12	Carman No. 1	Oval White	440	00	290	64	149	36
13	Garnet Chili	" Red	433	24	376	12	57	12
14	Green Mountain. (1 row)	Round White	431	12	325	36	105	36
15	American Wonder	Long "	422	24	316	48	105	36
16	Gold Coin	Round "	420	12	321	12	99	00
17	Burbank Seedling	Long "	409	12	325	36	83	36
18	California Red	Oval Red	398	12	327	48	70	24
19	Irish Cobbler	Round White	396	00	325	36	70	24
20	Early Puritan	Oval "	374	00	246	24	127	36
21	Rochester Rose	" Red	343	12	211	12	132	00
22	Ashleaf Kidney. (1 row)	Round White	334	24	233	12	101	12
23	Rawlings Kidney	Oval "	316	48	264	00	52	48

In the spring of 1913 five varieties of potatoes were sent to Ottawa for identification purposes. They were grown there in 1913 and compared with varieties under the same name. Samples true to type were returned, and after treatment were planted at

the end of the row of the same variety, the seed of which had been produced at the Charlottetown Station in 1913. The following table gives the results:—

Name.	Yield per acre Ottawa seed.		Yield per acre Ch'town. seed.	
	Bush.	Lb.	Bush.	Lb.
McIntyre	308	00	528	00
Irish Cobbler	37	00	396	00
Rochester Rose	17	36	343	12
Late Puritan	16	30	576	24
Gold Coin	6	36	420	12

The plants from the seed grown at Ottawa started well, but after attaining the height of about eight inches they remained almost stationary. Rhizoctonia, known as Little Potato disease, was present. The striking feature shown in the table is the wonderful resistance of the McIntyre to the disease that affected the other varieties.

The results shown would indicate the value of planting home-grown seed that is free from disease.

FLOWERS.

ANNUALS.

The annual flowers added much to the attractiveness of the grounds about the Station. The bloom was a little late in the spring, but owing to the profuse supply of moisture during June and July they made a strong growth and gave an abundance of magnificent bloom during the summer and autumn. Only two serious pests occurred to injure the annual flowers. These were the aster blight and the root aphis on the sweet peas and asters. Investigational work was started to learn how to combat both of these. The following is a record of the details concerning some of these annuals:—

No. of Varieties.	Name.	Date planted under glass.	In bloom		Remarks.
			From	To	
20	Aster	April 27	Aug. 5	Oct. 16	Badly blighted.
1	Alyssum	July 2	" 30	" 16	Good.
17	Antirrhinum	April 27	July 27	Nov. 5	Excellent.
1	Balsam	" 27	Aug. 20	Oct. 15	Fair.
1	Candytuft	July 2	" 30	" 15	Good.
2	Carnation	April 27	Sept. 16	" 16	Fair.
1	Castor Oil	" 27	Aug. 16	Nov. 2	Good.
1	Chrysanthemum	" 27	July 12	Oct. 24	"
1	Cockscomb	" 27	" 21	" 10	"
6	Coreopsis	" 27	" 7	Nov. 2	"
1	Cosmea	May 4	" 13	Oct. 18	"
6	Godetia	" 4	Aug. 16	Nov. 11	Extra good.
1	Marigold	" 4	" 9	" 2	Good.
8	Nasturtium	" 4	July 19	Oct. 16	Fair.
4	Nemesia	April 27	Aug. 20	Nov. 6	Good.
1	Nicotiana	May 4	July 23	Oct. 29	Very good.
5	Petunia	April 27	" 26	Nov. 4	Good.
7	Phlox Drummondii	" 27	" 15	" 10	Very good.
1	Portulaca	" 27	" 14	Oct. 20	Extra good.
2	Salvia	" 27	Aug. 4	" 29	Good
6	Stocks	" 27	July 22	" 6	"
1	Sweet Sultan	" 27	Aug. 4	Nov 16	"
3	Verbena	" 27	" 17	" 5	

CHARLOTTETOWN.

BULBS.

The cool dull weather produced extra large and perfect blooms on the bulbs, which remained in bloom for a longer period than usual. Very fine bulbs were produced and replanted. The narcissi seem to improve the longer they are grown here. A list of the varieties is here given, with some of the details regarding their growth.

The tulips were planted in various colour schemes in the flower beds in October and mulched in the fall. The mulch was removed early in the spring and the ground stirred about the bulbs which came up as soon as the snow was off them.

The narcissi were placed in a border and made a beautiful showing all along the road from the residence to the public highway. The other bulbs bloomed in their season and gave the lawns a bright appearance all through the cold spring.

EARLY TULIPS.

Variety.	Height.	Colour.	Blooming Period.	
			From	To
	Ft. In.			
Artus	17	Bright red	May 24	June 20.
Chrysolora	17	Orange yellow	May 21	June 7.
Cottage Maid	17	Rose and white	May 23	June 8.
Duchesse de Parma	19	Brick red	May 24	June 18.
Joost van Vondel (red)	18	Red	May 22	June 11
" " " (white)	17	White	May 22	June 8.
Keizerskroon	15	Red and yellow	May 23	June 8.
La Reine	17	White	May 23	June 8.
Pottebakker scarlet	18	Scarlet	May 23	June 11.
" white	19	White	May 23	June 7.
Vermilion Brilliant	16	Scarlet	May 22	June 20.
Couronne d'or	18	Orange yellow	May 23	June 11.
Imperator Rubrorum	16	Scarlet	May 21	June 11
Murillo	17	Pink and white	May 23	June 11.

LATE TULIPS.

Variety.	Height.	Colour.	Blooming Period.	
			From	To
	In.			
Darwin	24	Varied colours	June 8	July 1.
Gesneriana Spathulata	16	Scarlet	June 9	July 2.
Isabella	17	Pink and white	June 9	June 28
La Candeur	17	White	June 7	June 27.
La Merveille	22	Bronze salmon	June 5	July 3.
Picotee	22	White pink edged.	June 8	June 26.
Yellow Rose	13	Golden yellow	June 8	June 30.

OTHER BULBS.

Variety.	Height.	Colour.	Blooming Period.	
			From	To
	In.			
Anemone—				
Anemone coronaria, double mixed	12 to 15	Varied	June 2	July 31.
Anemone coronaria, single mixed	12 to 15	Varied	June 2	July 31.
Anemone St. Brigid	12 to 15	Varied	June 2	July 31
Chionodoxa.—				
Chionodoxa Luciliae	6	Blue	April 21	May 8.
Crocus.				
Crocus, general mixed	5	Mixed	April 24	May 18.
Freesia —				
Freesia refracta	....	....	Winter-	killed.
Iris.—				
Iris hispanica, mixed	16	Varied	July 15	Aug. 2.
Iris anglica, mixed	16	Varied	July 18	Aug. 13.
Narcissus.—				
Albo pleno odorato	16	White	May 22	June 3.
Incomparabilis plenus	16	Rich yellow	May 25	June 12.
Jonquilla plena	16	....	May 25	June 12.
Orange Phoenix	16	Orange and white.	May 22	June 10.
Double van Sion	16	Yellow	May 23	June 10.
Barri Conspicuus	14	Yellow	May 25	June 6.
Cynosure	15	Orange cup	May 26	June 11.
Emperor	10	Yellow	May 20	June 8.
Empress	10	Yellow and white.	May 10	June 10.
Figaro	12	Pale yellow	May 22	June 8.
Golden Spur	11	Deep yellow	May 18	May 30.
Poeticus	12	Pure white	June 5	June 11.
Poeticus, Ornatus	12	" "	June 3	June 11.
Princeps	11	Yellow	May 20	June 5.
Sir Watkin	15	Deep yellow	May 21	June 10.
Victoria	10	Clear yellow	May 22	June 8.

PERENNIALS.

The collection of perennials was very much appreciated by visitors to the Station. Many of the ladies attending the Farmers' Institute picnics took notes on such as would meet their requirements. These hardy flowers require much less attention during the busy seasons on the farm than annuals, and are becoming deservedly popular in rural communities.

As the hundreds of varieties of perennials that are being tested at the Station have become more firmly established the quantity of bloom has greatly increased. These perennials have been planted in large permanent borders along the avenues of the Station and along the Mount Edward road.

The Kentucky water lilies bloomed profusely, and are rapidly covering the pond to the west of the buildings with a mass of beautiful floating leaves and pink and white flowers.

CHARLOTTETOWN.

CHEMICAL COMPOUNDS FOR KILLING WEEDS.

An experiment with chemicals was conducted to determine the best method of keeping roads and paths clean and free from weeds and grass.

The following table describes the solutions, application and results:—

No.	Treatment.	How Applied.	Date.	Effect.
1	Common salt, 1 pound to 1 gallon of water..................	Hot...............	June 29.	Unsatisfactory.
2	Common salt, 2 pounds to 1 gallon water.	Hot....	July 4.	Unsatisfactory.
3	White arsenic 1 pound, washing soda 2 pounds, water 6 gallons	Boiled and sprayed on hot.....	June 29.	Killed most of the grass.
4	Bluestone 2 pounds, water 6 gallons . ..	Sprayed cold......	June 29.	Better than No. 3; killed all weeds.
5	Sulphuric acid, 1 part to 1,000 parts water,	Sprayed cold......	June 29.	No effect.
6	Sulphuric acid, 1 part to 500 parts water..	Sprayed cold.. . .	July 4.	No effect.
7	Acid sulphate of soda, 1 pound to 1 gallon of water....	Sprayed cold	June 29.	Killed most of the grass.
8	Herbicide, 1 part to 20 parts water. .. .	Sprayed cold.....	June 29.	Killed weeds and most of the grass.
9	Herbicide.....	Sprayed cold.....	July 4.	Fairly good.

While many of these did fair work they were expensive if used in any but a small way. We found hand hoeing the cheapest and most satisfactory method.

CHARLOTTETOWN.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

The following comprises the annual report of the horticultural work done on the Experimental Farm at Nappan, N.S., for the year 1914-15.

SEASONAL NOTES.

From a horticultural standpoint the season of 1913-14 was unsatisfactory. The winter was very severe, the temperature falling on one occasion to −27 degrees Fahr., and temperatures in the neighbourhood of −20 degrees were frequently recorded. Some exceptionally severe snowstorms were experienced and the ground was well covered with snow the greater part of the winter. After it disappeared during the latter part of March, however, some heavy freezing and thawing occurred. As a result of this, winter-killing was fairly general, particularly with strawberries and apple trees.

The spring was cold and backward, the fine weather of the latter part of May being succeeded by a cold and wet June. On the 4th of this month a frost of 6 degrees was recorded. This did considerable damage. The summer months were also cooler than usual, the highest temperature recorded during the season being 84 degrees. This period was also marked by frequent rains.

The fall started in wet very early, this weather continuing until the approach of winter. As a consequence of this the soil at this Station, which is mostly of a clay formation, soon became unworkable.

The crops of both the large and small fruits were below the average. Vegetables also made unsatisfactory growth. The flowers, ornamental trees and shrubs, however. did particularly well and were a continual source of interest to visitors.

Some Weather Observations taken at Nappan Experimental Farm, 1914.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall	Snowfall.	Total.	
1914.	°	°	°	Inches.	Inches.	Inches.	Hours.
January	46	−19	13·5	1·30	17·00	3·00	92·40
February	42	−27	07·5	0·30	23·00	2·60	138·50
March	46	8	30·17	1·73	4·00	2·13	107·85
April	61	8	33·94	1·89	18·00	3·69	172·05
May	79	24	49·03	0·75	....	0·75	147·10
June	77	26	54·19	4·23	....	4·23	243·30
July	84	35	61·54	3·61	....	3·61	255·00
August	84	40	62·84	2·95	....	2·95	210·80
September	84	33	56·25	3·05	....	3·05	161·75
October	69	20	27·02	2·46	....	2·46	139·35
November	60	7	33·59	2·97	....	2·97	85·75
December	51	−17	20·22	1·46	....	1·46	110·15
Total for year				26·70	62·00	32·90	1864·20
Average for five years				30·83	56·74	36·71	2003·04
Total for six growing months, April to September				16·48	18·00	18·28	1190·20
Average for five years for 6 growing months, April to Sept.				17·56	6·3	18·19	1298·65

LARGE FRUITS.

The crop of large fruit from the standpoint of quantity was rather a disappointing one this season. The quality of the fruit more than compensated for the shortage in quantity, however, particularly in apples. Notwithstanding the very favourable season for fungi development, such diseases were much less prevalent than in former years. This was undoubtedly due to a large extent to the thoroughness and frequency of the spraying operations.

Four sprayings of the following mixture were given during the season: Commercial lime-sulphur of the strength of 1 degree Baume and lead arsenate 2½ pounds in 40 gallons water. The first spraying was applied just after the buds opened, followed by another on the falling of the blossoms. The other two applications were made at intervals of two weeks. To the last application one ounce of Black Leaf 40 to every 40 gallons water was added to control the apple aphis, which was becoming troublesome.

SPRAYING EXPERIMENTS.

An experiment was conducted to test out the value of Bordeaux and lead arsenate as an orchard spray when compared with commercial lime-sulphur and lead arsenate. For this purpose sixteen plots were laid off in the wood orchard, eight of which received four applications of Bordeaux of the standard strength and eight, lime-sulphur; 2½ pounds of lead arsenate to every 40 gallons being added to both the Bordeaux and the lime-sulphur. When harvested, a representative sample was taken from each plot and the fruit sorted and graded. The following table gives the results:—

Comparison of Bordeaux and Lime-sulphur—Spraying Experiment.

Variety.	Lime Sulphur.					Bordeaux.				
	Clean.	Wormy.	Scab.	Russeted.	Oyster Shell Scale.	Clean.	Wormy.	Scab.	Russeted.	Oyster Shell Scale.
	%	%	%	%	%	%	%	%	%	%
Beautiful Arcade	78·57	17·86	.....	.....	3·57	55·84	10·4	...	25·96	7·78
Long Arcade	66·6	20·98	4·11	6·58	1·64	23·52	19·32	1·68	52·52	2·94
Grandmother	72·34	11·70	2·12	13·83	..	57·81	10·93	14·06	17·19	...
Duchess	67·07	23·17	3·65	6·09	.....	45·23	23·8	...	30·95	...
Pointed Pipka	86·95	10·43	..	.....	2·6	74·11	15·3	1·17	5·88	3·53
Antonovka	79·62	14·81	.....	5·55	...	23·21	14·28		58·92	3·55
Winter Bough	70·0	22·0	.....	2·0	6·0	62·71	11·86		25·42	.....
Pewaukee	88·2	4·91	1·63	4·91	...	61·8	28·5	1·5	7·5	..
Average	76·17	15·73	1·44	4·87	1·72	50·55	16·79	2·30	28·04	2·22

While this represents the result of one year's work only, nevertheless the figures are fairly conclusive. In nearly every case the Bordeaux sprayed fruit showed a much higher percentage of russeting than that treated with lime-sulphur. This experiment will be continued another year.

Another experiment was conducted at this Station to compare lime-sulphur and Black Leaf 40 with lime-sulphur and arsenate of lead. Standard strengths were used in all cases and the same procedure followed as in the previous experiment. The following were the results obtained:—

Nappan.

SPRAYING EXPERIMENT—Lime-sulphur and Black Leaf 40 *versus* Lime-sulphur and Lead Arsenate.

Variety.	Lime-sulphur and Black Leaf 40.				Lime-sulphur and Lead Arsenate			
	Clean.	Wormy.	Scab.	Other Defects.	Clean.	Wormy.	Scab.	Other Defects.
	%	%	%	%	%	%	%	%
Alexander	70·96	12·09	....	16·85	33·33	26·66	16·66	23·33
McIntosh Red	58·0	6·0	36·0	....	70·0	4·0	26·0	....
Average	64·48	9·04	18·0	8·42	51·66	15·33	21·33	11·66

In accepting the above figures, it must be borne in mind that the work represents one year's results and then only on a small scale. One cannot form any definite conclusions, therefore, until the work has been continued over a number of years and on a larger scale.

A test was also made of Bordeaux mixture and Black Leaf 40 in combination. Four applications were given and no injurious effects could be noted.

NAPPAN.

COMMERCIAL ORCHARD.

As in previous years, a complete record was kept of all the expenditures and revenue in connection with the commercial orchard, the purpose of this being to find the actual cost of bringing an orchard into profitable bearing. The vegetable garden, vegetable test plots and potato test plots were located as intercrops in the orchard and all revenue arising from sales of same have been credited to it. The following table shows the detailed account:—

Commercial Orchard.

Date.	Work engaged in.	Manual labour at 17 cts. per hour.	Cost.	Horse Labour and Teamster, 1 horse 27 cents: 2 horse 34 cents: 3 horse 41 cents; 4 horse 48 cents.	Cost.
			$ cts.		$ cts.
1911			69 50		28 80
1912			19 50		23 90
1913			38 00		35 15
1914.					
Apr. 25	Pruning	1 man 2 hours	34		
May 25	Ploughing			2 teams 20 hours at 34 cents	6 80
" 26	Harrowing			1 team 5 hours at 48 cents	2 40
" 26	"			1 " 5 " 34 "	1 70
	Spreading manure	1 man 20 hours	3 40	1 " 20 " 34 "	6 80
		25ton manure at $1	25 00		
May 29	Spraying			1 team 1 hour at 27 cents	27
June 2	Planting strawberries	3 men 26 hours	4 42	1 " 2 " 27 "	54
" 4	Planting garden	3 " 21 "	3 57		
" 6	Digging couch grass	4 " 20 "	3 40		
" 8	Planting garden	3 " 23 "	3 91		
" 11	Cultivating garden			1 team 2½ hours at 27 cents	68
" 11	Planting potatoes	4 men 18½ hours	3 15	1 " 1½ " 34 "	51
" 12	" "	4 " 24 "	4 08	1 " 1 " 34 "	34
" 18	Spraying	2 " 1½ "	26	1 " ¾ " 27 "	20
" 19	"	2 " 1½ "	26	1 " ¾ " 27 "	20
" 19	Planting potatoes	1 " 1 "	17		
" 22	Harrowing down potatoes			1 team 1½ hours at 27 cents	41
" 22	Digging couch grass	3 men 15 hours	2 55		
" 22	Spraying cabbage	2 " 3 "	51		
" 23	Digging couch grass	4 " 26 "	4 42		
" 23	Spraying cabbage	2 " 3 "	51		
" 24	Transplanting tomatoes onions	2 " 6 "	1 02		
" 25	Cultivating	1 " 4 "	68	1 team 4 hours at 27 cents	1 08
" 25	Hoeing	3 " 6 "	1 02		
" 27	Cultivating	1 " 1 "	17	1 team 1 hour	27
" 27	Sowing poisoned bran	2 " 1 "	34		
" 29	Harrowing down potatoes			1 team ¾ hour at 34 cents	26
July 6	Hoeing	1 " 2½ "	43		
" 8	"	3 " 10¼ "	1 75		
" 9	Spraying	2 " 3 "	51	1 team 1½ hours at 27 cents	41
" 10	Hoeing	2 " 4 "	68		
" 11	Spraying cabbage	2 " 3 "	51		
" 11	Hoeing	3 " 6 "	1 02		
" 14	"	2 " 16 "	2 72		
" 15	"	2 " 6 "	1 02		
" 16	Cultivating	1 " 7 "	1 19	1 team 7 hours at 27 cents	1 89
" 17	"	1 " 7 "	1 19	1 " 7 " 27 "	1 89
" 21	"			2 men 7 hours at 27 cents	1 89
" 24	Hoeing	3 men 6 hours	1 02		
" 24	Cultivating			1 team 6 hours at 27 cents	1 62
" 25	" hoeing and picking stone	5 men 42½ hours	7 23		
Aug. 6	Hoeing	2 " 10 "	1 70		
" 7	Cultivating			1 team ½ hour at 27 cents	14

Nappan.

COMMERCIAL ORCHARD.—*Continued.*

Date.	Work engaged in.	Manual labour at 17 cts. per hour.	Cost.	Horse Labour and Teamster, 1 horse 27 cents; 2 horse 34 cents; 3 horse 41 cents; 4 horse 48 cents.	Cost.
			$ cts.		$ cts.
Aug. 8	Cultivating			1 team 3 hours at 27 cents	81
" 8	Ridging potatoes			1 " 3 " 27 "	81
" 10	Hoeing	1 man 8 hours	1 36		
" 10	Spraying	2 men 4 "	68	1 team 2 hours at 27 cents	54
" 17	Hoeing and picking beans	3 " 27 "	4 59		
" 18	Picking beans	3 " 7½ "	1 28		
" 27	Dipping trees	3 " 10½ "	1 79		
Sept. 1	Hoeing	2 " 8 "	1 36		
" 3	"	1 " 3 "	51		
" 3	Setting strawberries	2 " 5 "	85		
" 3	Picking cucumbers	2 " 2 "	34		
" 8	" "	2 " 2 "	34		
" 14	" "	2 " 2 "	34		
" 29	Harvesting vegetables	3 " 12 "	2 04		
Oct. 1	Picking cucumbers	2 " 3 "	51		
" 2	Pulling beans	1 " 1 "	17		
" 3	Pulling onions	1 " 2 "	34		
" 7	Gathering onions, etc.	2 " 3 "	51		
" 8	Removing vines, etc.	1 " 1 "	17	1 team 1 hour at 27 cents	27
" 10	Cutting corn	3 " 2½ "	43		
" 15	Digging potatoes	5 " 45 "	7 65	1 team 2 hours at 34 cents	68
" 21	" "	5 " 37 "	6 29	1 " 2 " 34 "	68
" 21	Cutting cabbage	1 " 8 "	1 36		
" 22	Digging potatoes	1 " 13 "	2 21	1 team 1 hour at 34 cents	34
Nov. 10	Pulling turnips and parsnips	2 " 3½ "	60		
" 18	Covering strawberries	2 " 2 "	34	1 team 2 hours at 34 cents	68
	Garden seed		7 65		
	Strawberry plants	3000 at $6	18 00		
	Seed potatoes	10 bus. at 50 cents.	5 00		
		Manual labour	277 96	Horse labour	122 96
			Total expenditure		$400 92

REVENUE.—Revenue from former year, $70.20; from sale of peas, beans, lettuce, cucumbers, tomatoes, carrots, cauliflower, cabbage, pumpkins, potatoes, corn, turnips, squash, vegetable marrow, Brussel sprouts and onions, 1915, $115.66; total revenue, $196.16.

This orchard, which was established in 1911, is making a very satisfactory growth and came through the winter in fairly satisfactory condition. A few trees died from root injury sustained during the very severe weather in March, when the ground was unprotected with snow. These will be replaced as soon as possible.

A series of cover crop experiments were started in this orchard this year for the purpose of testing the value of various crops for this purpose and also to determine, if possible, the best method to follow in handling same. The following is an outline of the experiment:—

Block No. 1 received clean cultivation up to the middle of July, when cover crops of crimson clover and common vetch were sown. This will be ploughed under in the spring and followed by clean cultivation until the middle of July, as before.

Block No. 2 was seeded with the same mixture, at the same time. In this plot, however, the growth of only one side of the rows of trees will be turned under, the other being left. This process is reversed every year, that is, one side turned under one spring and the other the next.

Block No. 3 was permanently seeded with a grass mixture and the crop will be cut and left lying on the ground.

NAPPAN.

Block No. 4 was also permanently seeded. The crop from this, however, will be cut and removed.

Blocks 1 and 2 contain four rows of trees each, thus permitting a test to be made of four crops at the same time, one row in each block being given to the same crop.

PLUMS, PEARS AND CHERRIES.

The returns of the plums, pears and cherries were very light this season. This orchard is now practically past its usefulness, having been started in 1891-92. Several of the trees are missing and the remaining ones lack vigour. A brief summary of the results obtained in the variety tests of the 80 varieties plums, 42 varieties cherries and 40 varieties pears is given below. Those results of course apply chiefly to this section of Nova Scotia. It should be noted that the site of this orchard was very exposed and the test was, therefore, a most severe one.

PLUMS, Results of Variety Tests.

Variety.	Class.	Quality.	Hardiness.	Productiveness.	Adaptability for this Section.
Abundance	Jap	Medium	Delicate	Good	Good.
Anaster			Delicate		Poor.
Arch Duke	Eur	Medium	Medium	Good	Good.
Apple Plum	Eur		Delicate		Poor.
Baker Prune	Eur	Medium	Hardy	Good	Good.
Black Hawk	Am	Poor	Hardy	Good	Fair.
Bohemian	Eur	Medium	Hardy		Fair.
Botan	Jap	Poor	Hardy	Good in alternate years	Fair.
Bradshaw	Eur	Good	Hardy	Good	Good
Bryanston Gage	Eur	Good	Hardy	Good	Good
Cheney	Am	Good	Hardy	Medium	Fair.
Coe Golden Drop	Eur	Medium	Delicate	Medium	Fair.
Columbia	Eur	Good	Medium	Medium	Fair.
Consul	Am		Medium.		
Damson	Eur	Good	Hardy	Good	Good.
Diamond	Eur	Good	Medium	Good	Very good.
Don	Am		Delicate		Poor.
Duane Purple	Eur	Good	Medium	Medium	Poor (very susceptible to B.K.)
De Soto	Am	Medium	Medium		
Emerald	Eur	Good	Medium	Good	Fair.
Fellenberg (I. Prune)	Eur	Fair	Hardy	Good	Fair.
Field	Eur	Good	Medium	Good	Fair.
German Prune	Eur	Medium	Hardy	Good	Good.
Giant Prune	Eur		Delicate		Poor.
Glass Seedling	Eur	Medium	Hardy	Medium	Fair.
Goliath	Eur	Good	Medium	Good	Fair.
Grand Duke	Eur	Good	Hardy	Good	Good.
Gueii	Eur	Medium	Hardy	Good	Good.
Hawkeye	Am	Good	Medium	Good	Good.
Hudson River Purple Egg	Eur	Good	Delicate		Poor.
Hughes	Am	Good	Hardy	Good	Good.
Improved Lombard	Eur	Good	Delicate		Poor.
Imperial Gage	Eur	Good	Hardy	Good	Good.
Jefferson	Eur	Good	Medium	Good	Fair.
John A	Eur		Delicate		Poor.
Lawrence	Eur		Hardy		
Lawrence Favorite	Eur	Fair	Hardy	Medium	Fair.
La Hermosa			Delicate		Poor.
Leonard	Am		Hardy		
Lester	Am		Hardy		
Lombard	Eur	Good	Hardy	Good	Good.
Long Red Sweet	Eur	Fair	Hardy	Good	Good.

PLUMS, Results of Variety Tests.—*Continued.*

Variety.	Class.	Quality.	Hardiness.	Productiveness.	Adaptability for this Section.
Lucombe Nonesuch	Eur	Good	Medium	Good	Fair.
Mereton Egg	Eur		Medium		
McLaughlin	Eur		Hardy		
Mollie	Am	Poor	Hardy		Poor.
Monarch	Eur	Good	Medium	Good	Very good.
Moore Arctic	Eur	Medium	Medium	Good	Fair.
Mariana	Am		Hardy		
Ogon	Jap	Medium	Hardy	Medium	Fair.
Old Gold	Am	Medium	Hardy	Good	Fair.
Orange	Eur	Medium	Medium	Good	Fair.
Oscar			Hardy		
Oullin Golden	Eur	Good	Hardy	Medium	Fair.
Pond Seedling	Eur	Good	Medium	Medium	Fair.
Prince Yellow Gage	Eur	Good	Medium	Good	Fair.
Prince of Wales	Eur		Hardy		
Princess Louise	Eur		Hardy		
Quackenboss	Eur	Fair	Hardy	Medium	Fair.
Red Egg	Eur	Fair	Medium	Medium	Fair.
Reine Claude	Eur	Good	Hardy	Good	Good.
Reine Claude de Montmorency	Eur	Good	Medium	Good	Fair.
Rockford	Am		Medium		
Rollington Gage	Eur		Hardy		
Saunders	Eur	Good	Medium	Medium	Fair.
Shipper Pride	Eur	Good	Medium	Good	Fair.
Smith	Eur	Good	Medium	Medium	Fair.
Spaulding	Eur	Good	Hardy	Good	Good.
Stoddard	Am	Good	Poor	Medium	Poor.
Tennant Prune	Eur		Poor		Poor.
Ungarish	Eur	Good	Hardy	Good	Good.
Victoria	Eur	Good	Hardy	Good	Good.
Washington	Eur	Good	Medium	Poor	Poor.
Wayland	Am		Poor		Poor.
Weaver	Am		Poor		Poor.
Wolf	Am	Good	Hardy	Medium	Fair.
Whyte Seedling	Am		Medium	Medium	Fair.
Yellow Egg	Eur	Medium	Hardy	Good	Fair.
Yellow Moldavka	Eur	Medium	Hardy	Good	Fair.

PEARS, Variety Tests.

Alma	Medium	Hardy	Medium	Fair.
Bartlett	Good	Poor	Medium	Poor.
Bessemianka	Poor	Good	Good	Fair.
Beurre Clairgeau	Good	Good	Good	Good.
Beurre Diel		Good		
Beurre d'Anjou	Good	Medium	Medium	Fair.
Beurre Superfin		Medium		
Beurre Hardy	Good	Good	Medium	Good.
Bezi de La Motte	Medium	Good	Good	Good.
Clapp Favorite	Good	Medium	Good	Medium.
Dana Hovey	Fair	Good	Poor	Poor.
Dempsey	Good	Poor		Poor.
Doyenne Boussock	Fair	Good	Good	Fair.
Dr. Reeder		Fair		Poor.
Duchess	Good	Fair	Fair	Fair.
Fame		Poor		Poor.
Fredrick Clapp	Good	Poor		Poor.
Flemish Beauty	Good	Good	Good	Good.
Giffard	Fair	Good	Fair	Fair.
Goodale	Fair	Poor	Good	Poor.
Howell	Fair	Good	Poor	Fair.
Idaho		Poor		Poor.
Japan Golden Russet	Fair	Good	Good	Fair.
Kieffer	Poor	Fair	Good	Fair.
Koonce	Fair	Good	Good	Fair.

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PEARS, Variety Tests.—*Continued.*

Variety.	Quality.	Hardiness.	Productiveness.	Adaptability for this Section.
Lincoln	Fair	Good	Fair	Fair.
Longworth	Fair	Good	Good	Good.
Louise Bonne	Good	Poor	Fair	Poor.
Matilda		Good		
Mt. Vernon	Poor	Good	Good	Fair.
Onondago	Fair	Fair	Poor	Poor.
Osband Summer	Good	Good	Fair	Good.
President Drouard	Good	Poor		Poor.
Rutter	Fair	Fair	Good	Fair.
Seckel	Good	Good	Fair	Good.
Sheldon	Fair	Good	Fair	Fair.
Souvenir du Congrès	Poor	Poor		Poor.
Triumph	Good	Poor	Good	Poor.
Tyson	Good	Good	Good	Good.
Vermont Beauty		Poor		Poor.
Wilder	Good	Poor	Fair	Poor.

CHERRY, Variety Tests.

Baird Seedling	Fair	Good	Fair	Fair.
Black Tartarian	Good	Fair	Fair	Fair.
Belle Magnifique	Poor	Good	Fair	Fair.
Bessarabian		Poor		Poor.
Black Eagle	Good	Fair	Fair	Fair.
Black Heart	Good	Fair	Fair	Fair.
Downer Late Red	Good	Fair	Fair	Fair.
Double Natte		Poor		Poor.
Dyehouse	Fair	Good	Good	Good.
Early Purple	Good	Fair	Fair	Fair.
Early Richmond	Good	Good	Good	Good.
Elton	Fair	Good	Good	Good.
English Morello	Good	Good	Good	Good.
Fouche Morello		Poor		Poor.
Governor Wood	Good	Poor	Good	Poor.
Grunner Glas	Fair	Good	Fair	Fair.
Ida		Fair		
Knight Early Black	Fair	Good	Good	Good.
La Victoria		Fair		
Leib	Fair	Good	Fair	Fair.
Lithaur		Good		
Louis Philippe	Fair	Good	Fair	Fair.
May Duke	Good	Good	Fair	Good.
Montmorency	Good	Fair	Fair	Fair.
Montmorency d'Ordinaire	Good	Good	Fair	Good.
Mezel	Good	Poor	Fair	Poor.
Napoleon	Fair	Poor	Good	Poor.
Ohio Beauty	Fair	Good	Good	Good.
Orel 25	Fair	Good	Good	Good.
Ostheim	Fair	Good	Fair	Fair.
Rockport	Good	Poor	Fair	Poor.
Shaw Seedling		Good		
Simbirsk		Fair		
Spath Amarelle	Fair	Good	Good	Fair.
Sparhawke Honey		Fair		
Suda Hardy	Fair	Good	Fair	Fair.
Tradescants	Good	Fair	Good	Good.
Treens Seedling	Fair	Good	Good	Good.
Vladimir		Poor		Poor.
Weir		Fair		
Windsor	Fair	Good	Good	Good.
Wragg	Fair	Good	Fair	Fair

NAPPAN.

SMALL AND BUSH FRUITS.

Sixty-four varieties of strawberries were again tested in plots $\frac{1}{528}$ acre in size. Several of these plots were entirely winter-killed, yet the total crop was an average one. The following are the yields of those plots which survived:—

Variety.	First ripe fruit.	Date of last picking.	Per Acre.
			Quarts.
Swindle	July 7	July 27	4,224
Bisel	" 7	" 27	11,352
Crescent	" 7	" 31	5,280
Ida	" 6	" 27	4,488
Jean d'Arc	" 2	" 31	5,808
Afton	" 4	" 27	14,124
G. H. Coughill	" 4	" 31	12,672
Senator Dunlap	" 4	" 27	8,448
Clyde	" 3	" 31	9,372
Lovett	" 3	" 27	6,732
Maggie	" 6	" 27	3,412
Early Beauty	" 2	" 27	4,488
Warfield	" 3	Aug. 7	9,504
Brandywine	" 3	July 31	8,580
Seedling No. 15	" 7	" 31	5,016
Wolverton	" 2	" 27	10,164
Gandy	" 2	" 27	8,844
St. Antoine de Padue	" 6	" 21	3,960
Captain Jack	" 6	" 31	7,788
Paris King	" 4	" 27	3,168
Seedling No. 12	" 4	" 27	8,844
John Little	" 3	" 27	22,704
Minute Man	" 6	" 27	2,900
Joe	" 8	" 31	4,356
Barton	" 6	" 27	8,976
Success	" 7	" 31	3,828
Carlton	" 7	" 31	6,732
Glen Mary	" 2	Aug. 7	10,032
Bederwood	" 3	July 31	10,560
Sample	" 9	" 27	3,696
Nick Ohmer	" 9	" 27	4,092
Wm. Belt	" 9	" 27	4,884
H. W. Beecher	" 3	" 27	10,296
Cole Seedling	" 9	" 27	3,168
Michel Early	" 6	" 25	8,976
Thompson Late	" 7	" 27	12,540
Haverland	" 6	" 31	7,128
Equinox	" 6	" 21	8,184

The bush fruit plantation gave small returns. This was due to a large extent to the unfavourable nature of the soil which was the site of this plantation.

The results of the test conducted with those fruits during the last few years indicate the following varieties as being best suited to this locality: Currant (Black): Victoria, Eagle, Climax, and Kerry. Currant (Red): Red Grape, Cumberland, Wilder, Red Dutch, and Pomona. Currant (White): Large White and White Cherry.

NAPPAN.

VEGETABLES.

The results of the vegetable tests this season were far from satisfactory. This was due to the unsuitability of the soil, lack of germinating power in the seeds and unfavourable weather conditions. As before stated, these tests were made in the commercial orchard. Such vegetables as cabbage, onions, tomatoes, celery, Brussels sprouts, etc., were started under glass during the first week of April, and the beans, peas, carrots, beets, turnips, parsnips and cauliflowers were sown in the open ground.

The following tables give comparative yields of some of the more important vegetables:—

PEAS (Sown in open soil June 4).

Variety.	Length of row.	Ready for use.	Yield in pounds.
	Feet.		
1. Stratagem	30	Aug. 20	1
2. Thomas Laxton	30	" 10	8¼
3. Telephone	30	" 12	3
4. American Wonder	30	" 8	2
5. Premium Gem	30	" 12	3¼
6. Gradus	30	" 13	4¼
7. Sutton Excelsior	30	" 10	5½
8. Heroine	30	" 10	*
9. Juno	30	" 20	½
10. Gregory Surprise	30	" 9	3¾
11. McLean Advancer	30	" 12	3⅝
12. Dainty Duchess	30	" 12	2⅛
13. Early Giant	30	" 13	2⅛
14. Quite Content	30	" 13	½
15. The Lincoln	†	†	†

*Poor germination. †Did not germinate.

BEANS (Sown June 8).

Variety.	Length of row.	Ready for use.	Yield in pounds.
	Feet.		
1. Extra Early Refugee	30	Aug. 16	23
2. Valentine (Red)	30	" 17	14½
3. Wardwell Kidney Wax	30	" 18	40¼
4. Stringless Green Pod	30	" 15	17¾
5. Refugee or 1000 to 1	30	" 12	16¼
6. Extra Early Valentine	30	" 15	11½
7. Keeney Rustless Wax	30	" 17	28½
8. Grennell Rustless Wax	30	" 20	9
9. Bountiful Green Bush	30	" 17	23

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CABBAGE (Sown under glass March 26).

	Variety.	Length of row.	Ready for use.	Yield.	
		Feet.		Heads.	Pounds.
1.	Large Late Flat Drumhead	30	Aug. 20	19	97
2.	Fottler Improved Brunswick	30	" 10	19	95
3.	Lubeck	30	" 10	17	85
4.	Magdeburg	30	" 10	15	72
5.	Small Erfurt	30	" 1	20	
6.	Winningstadt	30	" 15	16	85
7.	Danish Ballhead	30	" 15	19	52
8.	Danish Delicatesse Red	30	" 20	20	46
9.	Danish Summer Ballhead	30	" 10	11	46
10.	Flat Swedish	30	" 10	17	130
11.	Extra Amager Danish Ballhead	30	" 10	13	56
12.	Copenhagen Market	30	" 15	15	65

TOMATOES (Sown under glass April 8).

	Variety.	No. of Plants.	Ready for use.	Total Yield. Green, and ripe
				Pounds.
1.	Chalk Early Jewel		Sept. 20	15
2.	Rennies XXX Earliest	5	" 12	70¼
3.	Florida Special	5	" 25	53½
4.	Alacrity	5	" 5	81
5.	Extremely Early I. X. L	5	" 15	74½
6.	Prosperity	5	" 5	68
7.	Northern Adirondack Earliana Grade No. 1	5	" 8	72¾
8.	Jack Rose	5	" 13	66½

CUCUMBERS (Sown June 8).

	Variety.	No. of hills.	Ready for use.	Yield in pounds.
1.	Giant Pera	2	Sept. 1	38½
2.	Peerless White Spine	2	" 1	72½
3.	Cool and Crisp	2	Aug. 27	38½
4.	Prize Pickling	2	" 28	110¼
5.	Extra Early Russian	2	" 25	100½

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SQUASH (Sown June 8).

Variety.	No. hills.	Yield in Pounds.
1. Summer Crookneck	1	33½
2. Delicata	1	23
3. Custard Marrow (White Bush)	1	23
4. Long White Bush Marrow	1	55
5. White Congo	1	
6. Mammoth Whale	1	103
7. Hubbard	1	64
8. Golden Hubbard	1	12½
9. Delicious	1	
10. Long Vegetable Marrow	1	183

CARROTS (Sown June 4).

Variety.	Length of row.	Ready for use.	Yield in pounds.
	ft.		
1. Improved Nantes	30	Aug. 15	29
2. Half Long Chantenay	30	Aug. 15	[illegible]

Beets were a total failure owing to the seed failing to germinate; cauliflowers germinated very poorly, and the carrots and parsnips also showed lack of vitality.

Fourteen varieties of garden corn were planted, but the plants came along very slowly and none of the varieties matured. Six varieties of onions were started in the hotbed and transplanted to the garden in June. These also proved unsatisfactory, practically all of the plants growing into thicknecks only.

Five varieties of celery were started in hotbeds, pricked off the following month and transplanted to the open in June. The soil in which these plants were placed was a deep dark loam in excellent condition. Very satisfactory growth was made during the summer, some of the plants reaching twenty inches in height. Unfortunately a large percentage of the plants went to seed, thereby considerably reducing the yield. The following were the results obtained:—

CELERY.

Variety.	No. Plants.	Total yield.	Per cent Good.
		lb.	
1. Paris Golden Yellow	30	63	30
2. Giant Pascal	30	54	90
3. French Success	30	66	83·6
4. Noll Magnificent	30	48	40
5. White Plume	30	75	20

Variety tests of vegetables have been conducted at this Station for a considerable number of years, and the following list is compiled from the results obtained during that time:—

Vegetables.	Variety.	Years in test.	Results.
Onion	Johnston Dark Red Beauty	4	Medium.
	Danvers Yellow Globe	6	Good.
	Salzer Wethersfield	4	Medium.
	Large Red Wethersfield	4	Good.
	Dark Red Wethersfield	1	
	Southport Red Globe	1	
	White Globe	1	Medium.
	Red Globe	1	Medium.
Celery	Paris Golden Yellow	7	Good.
	Giant Pascal	5	Good.
	Rose Ribbed Paris	3	Medium.
	French Success	3	Medium.
	Noll Magnificent	3	Medium.
	Evans Triumph	2	Medium.
	White Plume	4	Medium.
Cabbage	Early Jersey Wakefield	10	Good.
	Early Paris Market	3	Good.
	Fottler Improved Drumhead	1	Medium.
	Large Late Flat Drumhead	4	Good.
	Extra Early Midsummer Savoy	3	Good.
	Fottler Improved Brunswick	5	Good.
	Lubeck	4	Good.
	Magdeburg	4	Medium.
	Small Erfurt	4	Medium.
	Winningstadt	6	Medium.
	Danish Ballhead	4	Medium.
	Danish Summer Ballhead	4	Good.
	Flat Swedish	4	Good.
	Improved Amager Danish Roundhead	3	Medium.
	Extra Amager Danish Ballhead	4	Good.
	Copenhagen Market	4	Medium.
Cabbage (Red)	Extra Dark Red Dutch	1	Medium.
	Danish Delicatesse Red	1	Good.
	Red Danish Stonehead	3	Good.
Cauliflower	Danish Giant	4	Good.
	Early Snowball	8	Good.
	Extra Selected Early Erfurt Dwarf	7	Good.
Brussels Sprouts	Dwarf Improved	4	Good.
Tomatoes	Sparks Earliana		Good.
	Chalk Early Jewel	6	Good.
	Bonny Best	3	Good.
	Trophy	3	Good.
	Matchless	9	Good.
	Livingston Globe	2	Medium.
	Rennie XXX Earliest	3	Good.
	Florida Special	1	Medium.
	Alacrity	3	Good.
	First of All	1	Good.
	Extremely Early I.X.L.	3	Good.
	Plentiful	2	Medium.
	Prosperity	2	Medium.
	Greater Baltimore	2	Poor.
	Northern Adirondack Earliana	3	Good.
	Jack Rose	1	Good.

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VARIETY Tests of Vegetables, etc.—*Continued.*

Vegetables.	Varieties.	Years in test.	Results.
Peas	Stratagem	11	Good.
	Thos. Laxton	10	Good.
	Telephone	9	Good.
	American Wonder	13	Medium.
	Premium Gem	3	Medium.
	Gradus	12	Medium.
	Sutton Excelsior	4	Good.
	Heroine	8	Medium.
	Juno	8	Good.
	Gregory Surprise	4	Good.
	McLean Advancer	4	Good.
	Paragon	1	Fair.
	Nott Perfection	1	Medium.
	Dainty Duchess	1	Medium.
	Early Giant	1	Medium.
	Quite Content	1	Medium.
	The Lincoln	1	Poor.
Beans	Extra Early Refugee	4	Good.
	Red Valentine	6	Medium.
	Wardwell Kidney Wax	6	Good.
	Stringless Green Pod	2	Medium.
	Refugee or 1,000 to 1	5	Good.
	Challenge Black Wax	2	Medium.
	Landreth Double Barrelled	2	Poor.
	Dwarf Extra Early	6	Medium.
	Grennel Rustless Wax	1	Poor.
	Beautiful Green Bush	1	Good.
Beets	Early Blood Red Turnip	3	Good.
	Eclipse	5	Good.
	Egyptian Dark Red Flat	4	Good.
	Black Red Ball	4	Good.
	Ruby Dulcet	4	Good.
	Meteor	4	Good
Carrots	Chantenay	3	Medium.
	Oxheart	3	Poor.
	Nantes	3	Good.
	Improved Nantes	4	Good.
	Half Long Chantenay	4	Good.
	French Horn	4	Medium.
Lettuce	Cos Trianon	2	Medium.
	Red Edge Victoria	4	Good.
	Black Seeded Simpson	4	Good.
	Grand Rapids	4	Good.
	All Heart	4	Good.
	Giant Crystal Head	4	Medium.
	Improved Hanson	4	Medium.
	Crisp as Ice	4	Medium.
	Iceberg	4	Medium.
	Unrivalled Summer	2	Poor.
	Dark Green Capucine	2	Good.
	Rousseau Blond Winter	2	Poor.
Radish	Forcing Turnip Scarlet	1	Good.
	Ne Plus Ultra	2	Medium.
	Rosy Gem	1	Medium.
	White Icicle	2	Medium.
	Early Scarlet White Tip	3	Good.
Parsley	Double Curled	6	Good.
Salsify	Long White	4	Good.
Parsnips	Hollow Crown	5	Good.
	Intermediate	2	Good.

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VARIETY Tests of Vegetables, etc.—*Concluded.*

Vegetables.	Varieties.	Years test.	Results.
Corn	Malakoff	2	Did not mature.
	Fordhook Early	3	Medium.
	Golden Bantam	2	Good.
	Early Evergreen	3	Medium.
	Black Mexican	2	Poor.
	Stowell Evergreen	3	Poor.
	Country Gentleman	3	Medium.
	Henderson Metropolitan	3	Poor.
	Early Malcolm	2	Good.
	Extra Early Adams	2	Did not mature.
	Perkins Early	1	Did not mature.
	Early Iowa	2	Medium
	Early Dawn	1	Did not mature.
	Pocohontas	1	Did not mature.
	Perkins Extra Early Market	1	Did not mature.
Cucumbers	Giant Pera	2	Medium.
	Peerless White Spine	5	Good.
	Cool and Crisp	2	Medium.
	Prize Pickling	2	Good.
	Extra Early Russian	2	Good.
Squash	Summer Crookneck	3	Medium.
	Delicata	2	Medium.
	Custard Marrow, White Bush	2	Medium.
	Long White Bush Marrow	4	Medium.
	White Congo	2	Medium.
	Mammoth Whale	2	Good.
	Hubbard	5	Good.
	Trailing White Vegetable Marrow	1	Medium.
	Golden Hubbard	2	Good.
	Delicious	2	Medium.
	Long Vegetable Marrow	1	Good.

As in previous years, uniform test plots of potatoes 1-100 of an acre in size were grown. These were planted in clay loam on June 11 and dug on October 15. Sixteen varieties were thus tested. Following are the results obtained:

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POTATOES.

Name of Variety.	Character of growth.	Average Size.	Total yield per acre.		Yield per acre, sound.		Yield per acre, rotten.		Yield per acre, of marketable.		Yield per acre, of unmarketable.		Form and colour.
			Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	
Everett	Strong	Medium	333	18	333	18	......		270	00	63	18	Round, flat, white.
Rawlings Kidney	"	"	285	36	285	36	......		251	36	34	0	" "
Wee McGregor	Fair	"	283	18	283	18	......		248	18	35	0	Oblong, white.
Gold Coin	Strong	"	282	24	282	24	......		238	18	44	6	Round, white.
Green Mountain	Irregular	"	279	54	279	54	......		251	36	28	18	Oblong, white.
Early Rose (Blair)	Fair	"	267	24	267	24	......		201	36	65	48	Long, pink.
Carman No. 1	Strong	Large	265	48	265	48	......		235	00	30	48	Round, white.
Rochester Rose	"	Medium	258	12	258	12	......		231	36	26	36	Oblong, pink.
Late Puritan	Weak	"	215	54	215	54	......		170	00	45	54	Long, white.
King Edward	Fair	"	203	12	203	12	......		159	6	44	6	Oblong, pink and white.
Irish Cobbler	Strong	Large	207	30	207	30	......		155	00	52	30	Round, white.
Early Rose	"	Medium	206	36	206	36	......		166	36	40	0	Long, pink.
Vick Extra Early	Irregular	Large	189	54	189	54	......		168	18	21	36	Long, white.
Reeves Rose	Strong	Medium	175	42	175	42	......		151	36	24	6	Long, pink.
Morgan Seedling	Weak	"	156	36	156	36	......		133	18	23	18	Long, pink and white.
Empire State	"	"	148	18	148	18	......		128	18	20	0	Oblong, white.
Dalmeny Beauty	Strong	"	135	42	135	42	......		101	36	34	6	"

NAPPAN.

The building up of an improved strain of five varieties of potatoes by field selection was started this year. The following varieties were the ones used: Irish Cobbler, Carman No. 1, Wee McGregor, Empire State and Rawlings Kidney.

The selection was made by having all hills in the test plots dug separately and then twenty-five of the best hills collected and weighed. All hills chosen had a high percentage of marketable potatoes of the proper type. Twenty-five average hills were also weighed for the purpose of comparison, and resulted as follows:—

Variety.	Selected Hills. Lb.	Average Hills. Lb.
1. Irish Cobbler..	44	30
2. Wee McGregor...	53	31
3. Carman No. 1..	43	27
4. Empire State..	49	33
5. Rawlings Kidney..	46	26

Next year this selected stock will be planted and again selected in the same way and the process continued indefinitely.

FLOWERS.

All flowers made very satisfactory growth and bloomed abundantly throughout a long season. Practically all of the annuals were started under glass and transplanted to the garden when the danger of frost had passed. The first sowing of seed was unfortunately a failure owing to the seeds not germinating, and this somewhat shortened the flowering season. The annuals grown included asters, alyssum, amaranthus, antirrhinum, balsam, bachelor button, candytuft, carnations, castor oil plant, centranthus, chrysanthemums, coreopsis, cosmos, daisy, larkspur, leptosiphon, lupinus, mignonette, nasturtiums, nemesia, pansies, phlox, poppy, salvia, Swan River daisy, verbena, everlasting and Clarkia.

Bulbs such as tulips, narcissi, gladioli, etc., made a good showing, but the greatest display was made by the dahlias, our collection of which is very fine. Thirty-five varieties of cactus, cactus hybrid, decorative, show and fancy show dahlias were grown.

An experiment was conducted with sweet peas to ascertain the effect of treating the seed with farmogerm. The peas were divided into four blocks, two being treated and two untreated. Observations were taken at various times during the season, but no difference could be noted.

The perennials bloomed well during the season and presented an attractive appearance. This border has been established some few years, however, and the plants are deteriorating in quality, some of the more desirable ones having died. An alteration is being effected in this feature of the ornamental grounds, and the new border will be in the form of a semi-circle instead of a straight bed as heretofore.

SHRUBS AND TREES.

All classes of shrubs and trees came through the winter in good condition and made satisfactory growth during the summer. The flowering shrubs made a particularly fine display during the summer months.

The various hedges are in a very healthy condition and require considerable attention. In one or two cases as many as five clippings had to be made. The Common Spiraea hedge was removed during August, for as it was making such rapid growth it threatened to interfere with the more desirable Norway Spruce hedge alongside of it.

NAPPAN.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. SAXBY BLAIR.

This is the third annual report of work done at this Station, and covers such experiments as it is thought may be of value. The orchards have been extended by additional planting of some new varieties of apples, peaches, plums, pears and cherries. Trial tests have been made of different vegetables. The show of bloom from the annual and perennial flowers has been good. The orchard experimental work started last season at Berwick, Kings County; Falmouth, Hants County, and Bridgetown, Annapolis County has been continued with some additional experiments.

The fruit crop has on the average been a medium one. In some places the crop was light due largely to frost injury, at blossoming time, June 4. The development of scab on unsprayed trees was hardly as bad as the previous season. The fruit trees on the whole have been better sprayed during 1914 than ever before and as a result most of the fruit has packed out well with a greatly lessened percentage of scab. The first development of scab was later than last season and the spray just before the blossoms opened seemed to be the one of greatest value. The winter of 1914-15 has been a favourable one for fruit trees and no winter injury has been reported.

WEATHER.

The temperature during the latter part of April and the first half of May was fairly uniform with no very warm periods to force trees into bloom and as a result leaf buds did not open until after the middle of May. The first spraying work was quite general from the 18th to the 25th. The mean average temperature from April 15th to May 1st was 41·2 degrees Fahr.; from May 1st to 15th, 43·4 degrees, and from May 15th to 31st, 57·5 degrees. Frost was recorded at this Station May 1, 2, 12, 16, and 17 of 9, 4, 3, 2, and 1 degrees, respectively, and the temperature went to freezing on the 7th and 13th May. On June 4 our thermometer registered 32 degrees and the effect of the frost was noticeable at places on this Station. This frost was quite general through the valley but the temperature went low enough to do damage only in the lower lying areas along the Cornwallis Valley from Kentville to Kingston. Early blossoming varieties, especially the Gravenstein, suffered the most, and in some places the crop was a complete failure.

The mean average temperature for 1913 from April 15 to May 1 was 47·93 degrees Fahr.; May 1st to 16th, 44·73 degrees and May 16th to June 1st 47·97 degrees. For comparison it will be seen that the mean average from April 15th to May 15th in 1913 was 46·33 degrees, and for the same period in 1914, 42·3 degrees. The mean average for 1913 from May 15th to June 1st, 1913, was 47·97 degrees compared with 57·5 degrees in 1914. The season on the whole was favourable for fruit trees and where properly sprayed a good clean well-matured lot of fruit was secured. The first fall frost at this Station was on October 1st of 5 degrees. Frost was recorded on seven days during October, namely on the 1st, 7th, 14th, 15th, 25th, 26th, of 5, 6, 4, 3, 4, 6 and 7 degrees respectively. The month on the whole was a satisfactory one for harvesting the fruit crop.

The rainfall during the summer was ample except during July in which month only 1·45 inches of rain fell. The rainfall, however, during June was 4·2 inches which with good cultivation carried the trees through July without apparent injury.

The rainfall from May 1st to October was 28·75 inches. The sunshine during September was 173·8 hours and October 158·2 hours as compared with 156·6 in September, 1913, and 57·8 in October, 1913.

November was an exceptionally fine month with little frost to prevent ploughing throughout the whole month, and as a result much more fall ploughing than usual has been done. The first really cold weather was on the 19th when the thermometer registered 27 degrees of frost, this was followed by mild open weather until the 24th and 28th when 17 degrees was recorded and this was followed by mild weather. The rainfall during November was much less than usual and in many places a scarcity of water in wells has been reported. From the 2nd to the 11th there was sanshine on one day only, with a slight rainfall on eight days of this period.

From the 1st to the 5th of December was mild and ploughing was possible at this time. The first fall of snow was on the 11th of 1·62 inches. The next snowfall was on the 21st to 23rd when 8·02 inches made fair sleighing for Christmas. A thaw on the 29th and 30th took off all the snow. The coldest period was during Christmas week when the thermometer registered 6, 4 and 5 degrees below zero on the 25th, 26th and 27th, respectively.

January was not a cold month. The thermometer registered ¼ and 4 degrees below zero on the 5th, 30th and 31st as the coldest. The highest temperature was on the 7th and 19th of 51 and 56 degrees, respectively. The greatest daily range was on the 5th of 30 degrees.

There was good sleighing from the 21st to the 23rd only, and although 21·12 inches of snow fell during the month, this was followed by mild weather, or the snow was not of sufficient depth to make good sleighing. Sleighs were running in places, more or less throughout the month. Rain fell during 12 days in the month. There were three heavy thaws during the month on the 7th, 19th, 20th and 24th, which took out practically all the frost in the ground and caused bad washing on our fields.

February was also mild after the first week. On the 2nd, 3rd, 4th and 5th, 9, 4, 2 and 7 degrees below zero were recorded respectively and after this date the temperature during the month never went below 10 degrees above zero. There was little snow during the month, a fall on the 1st of 4 inches made fair sleighing until the 6th when a thaw set in and there was no more sleighing during the month. There was little rain during the month.

March has been an even month with no extreme temperature. The snowfall was light and not sufficient to make sleighing except an occasional day. There was no rain and a snowfall of 9½ inches. With no snow on the ground the usual washing from spring floods has been avoided.

METEOROLOGICAL RECORDS.

The mean average temperature, rainfall and hours of sunshine as recorded at the Experimental Station, Kentville, N.S., for the year commencing April, 1914, as compared with the previous year:—

Month.	Commencing April 1, 1914.			Commencing April 1, 1913.		
	Mean Average Temperature.	Rainfall.	Sunshine.	Mean Average Temperature.	Rainfall.	Sunshine.
	°	Inches.	Hours.	°	Inches.	Hours.
April	36·8	2·33	196·0	41·9	4·29	137·1
May	50·72	1·46	189·6	46·2	3·17	178·2
June	56·2	4·2	250·3	56·7	1·23	270·1
July	62·88	1·45	238·9	65·4	3·72	252·1
August	63·0	2·58	211·1	63·3	1·70	238·4
September	57·6	3·65	173·8	54·3	2·555	156·6
October	49·5	1·90	158·2	56·5	9·60	57·8
November	36·4	3·19	109·7	38·4	1·97	111·5
December	22·89	2·58	85·1	23·44	4·39	74·65
1915.						
January	22·83	4·75	73·4	19·68	2·80	91·6
February	25·6	1·25	99·6	14·19	2·59	118·7
March	26·81	0·95	103·1	30·72	3·73	118·2
Total	511·23	30·29	1,888·8	510·73	41·74	1,804·95
Average per month	42·6	2·52	157·4	42·56	3·47	150·41
Total for 6 growing months April to Sept.	....	15·67	1,259·7	327·8	16·66	1,232·5
Average for 6 growing months, April to Sept.	....	2·61	209·9	54·6	2·77	205·4

GROUNDS AND ORNAMENTAL PLANTING.

The grass on the lawns has not been as good as we had wished for. The soil is sandy, dry and poor, which during the summer is not suitable for a nice lawn, and as a result the grounds are not as attractive during the summer months as they should be. The shrubs and trees have made fair growth during the year.

The bulbs planted the previous fall gave a fine show of bloom commencing with the crocus and scilla the latter part of April and finishing with the late tulips in the middle of June. The annual flowering plants were attractive. The petunias, schizanthus, phlox Drummondii, pansies, nemesias, godetia, snapdragons, and cosmos were particularly good. The asters were a failure. The plants were apparently healthy at the start but gradually weakened, turned a sickly yellow and gave imperfect bloom. There seems to be little known about this disease, and so far we have not been able to suggest a remedy.

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SWEET PEAS.

Many sorts of sweet peas were grown. Six of the best sorts were: Nubian, dark maroon; Thomas Stevenson, orange scarlet; Maud Holmes, crimson; King White, white; Clara Curtis, cream; Asta Ohn, lavender; and Countess Spencer, pink. Additional good varieties are Mrs. Routzahn, shell pink; Helen Lewis, orange scarlet; Mrs. C. W. Breadmore, cream with pink edge; Moonstone, light lavender; Tennant Spencer, mauve; King Edward, crimson; John Ingman, pink; and Florence Nightingale, lavender.

Four varieties were started in pots in the greenhouse on the 18th March and April 1st and planted out May 4th.

Ten pots of each variety were sown. Four-inch pots were used, and three plants were allowed to a pot. They were taken out of the pots without disturbing the soil and the contents of each pot planted one foot apart. The plants were well hardened off before planting out and made continuous growth afterwards. The early sown plants were about 8 inches high when planted and the later sown 6 inches. They were supported in the pots by small twigs to keep them upright. The following table gives the date of bloom as compared with the same varieties sown outside:—

DATE OF BLOOMING.

When started.	Beatrice Spencer.	King Edward Spencer.	Tennant Spencer.	Countess Spencer.
March 18	July 6	July 7	July 8	July 4.
April 1	" 12	" 10	" 12	" 12.
May 4	" 25	" 25	" 25	" 25.

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VEGETABLES.

Tests were made of many of the different varieties of vegetables. A general summary is given below of the best kinds, the time the seed was started in flats, when the plants were set outside, and when fit to use.

Variety.	Seed Started.	Planted out.	Fit to use.
Lettuce—All-Heart (cabbage head)	March 28	May 9	June 23
Grand Rapids (open head)	" 28	" 9	July 1
Cabbage—Early Jersey Wakefield	" 28	" 9	" 8
Paris Market	" 28	" 9	" 7
Copenhagen Market	" 28	" 9	" 15
Summer Ballhead	" 28	" 9	August 1
Cabbage—Early Jersey Wakefield	April 15	June 10	August 10
Paris Market	" 15	" 10	" 10
Medium—Copenhagen Market	" 15	" 10	" 20
Summer Ballhead	" 15	" 10	September 3
Late—Danish Roundhead	" 15	" 10	" 10
Fottler Improved Drumhead	" 15	" 10	" 12
Late Flat Drumhead	" 15	" 10	" 12
Cauliflower—Early Dwarf Erfurt	March 28	May 9	July 3
Early Snowball	" 28	" 9	" 6
Tomatoes—Alacrity	March 28	June 8	August 8
Earliana	" 28	" 8	" 12
Chalk Early Jewel	" 28	" 8	" 14
Celery—Paris Golden Yellow	March 26	June 9	September 20
White Plume	" 26	" 9	" 26
Squash—Vegetable Marrow	May 9	June 16	August 20
Boston Marrow	" 9	" 16	September 9
Red Hubbard	" 9	" 16	" 12
Hubbard	" 9	" 16	" 20
Musk Melon—Earliest Ripe	March 28	May 11 in frame.	August 17
Paul Rose	" 28	" 11 "	" 21
Emerald Gem	" 28	" 11 "	" 22
Montreal Market	" 28	" 11 "	" 22
		Planted.	
Corn—Early Malcolm		June 6	September 6
White Cory		" 6	" 14
Crosby Early		" 6	" 21
Premo		" 6	" 21
Golden Bantam		" 6	" 21
Canada Yellow		" 6	October 1
Country Gentleman		" 6	" 1
Peas—Early, Gregory Surprise		May 9	July 7
Second Early, Excelsior		" 9	" 14
" Gradus		" 9	" 18
Late, Admiral Dewey		" 9	" 25
" Stratagem		" 9	" 26
" Juno (Dwarf)		" 9	" 27
Beans—Grenell Rustless wax		May 26	July 24
Wardwell Kidney wax		" 26	" 26
Red Valentine Green pod		" 26	" 29
Refugee Green pod		" 26	August 9

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—	Seed Started in Flats.	Transplanted Outside.	How Matured.
Onions—Prizetaker	February 28	May 9	Good.
Ailsa Craig	" 28	" 9	"
Prizetaker	March 17	" 9	"
Ailsa Craig	" 17	" 9	"
		Seed Sown.	How Matured.
White Queen		May 11	Good.
Australian Brown		" 11	Fair.
Danvers Yellow		" 11	"
Extra Early Red		" 11	"

ORCHARDS.

Additional plantings were made this year of orchard fruits, including the following trees, 208 standard apples, 94 pears, 41 cherries, 62 plums, 28 peaches, 5 Quinces, 36 dwarf apples on Paradise stock, 36 on Doucin stock and 18 dwarf pears on Quince stock. There have been 2,027 trees of apples, plums, cherries, pears, and peaches planted to date, including 1,068 apples, 259 pears, 175 cherries, 398 plums, 102 peaches and 25 quince and apricots. Forty-two acres are now planted to orchard fruits.

NUT TREES.

Two hundred and forty plants of filberts including 24 varieties of 10 trees each were set in rows of 20 feet apart and 10 feet apart in the rows. These were purchased from Barbier & Co., Orleans, France. Many of the plants failed to grow. Twenty Sober Paragon chestnuts and 16 English walnuts including 4 each of the varieties Rush, Pomeroy, Mayette and Franquette, and 4 Indiana pecan nut trees were planted on a side hill 40 feet apart. The Paragon chestnuts have for the most part made a good start. Some of the walnuts and pecans failed to start and those that did start made very poor growth.

SMALL FRUITS.

The bush fruits planted last season have made good growth. The cane fruits also did well except the blackberries of which Iceberg, Erie, Early Harvest, Blowers, Rathbun and Mersereau winter killed. Many of the grapes root killed and will be replaced. The following varieties of strawberries were added to those already planted: Tennessee Prolific, Howard Early, Virgilia, Julia, Mariana, Valeria, Portia, Desdemona, Ophelia, Cordelia, Cassandra, Williams, Enhance, Bubach, Lovett, Chesapeake and Excelsior. One thousand plants each of Stevens Late Champion, Senator, Dunlap, Sample and Pocomoke were also planted. The crop of berries on the plantation made last season was light.

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HEADING BACK APPLE TREES AT PLANTING TIME.

The usual practice is to cut back the tops of young trees at planting time. This heading in, as it is called, is practised much more severely by some planters than others, and some even do not take the trouble to do it all. This experiment was conducted with the object of finding out just what the gain was and whether the cutting back was of the benefit claimed for it.

Wagener apple trees two years old and uniform in every particular were used. There were six trees to each test and the results are as tabulated below.

Plot.	How Headed.	Average 1913.	Growth 1914.
		Inches.	Inches.
1	Three-quarters of the branches cut off	4·82	20·08
2	One-half of the branches cut off	3·5	12·75
3	One-quarter of the branches cut off	1·96	7·62
4	None of the branches cut off	1·00	2·84

Measurements were taken of all the branches developed since planting and it will be seen that the trees not headed back have made very little growth.

Plot 1.—All the trees made good strong growth and required little pruning at the end of the second year after planting to put them in good shape.

Plot 2.—Made fair growth, but a few fruiting spurs had developed at the base of the branches on some trees which indicated weakened growth. A heading back will be necessary on some trees to increase vigour.

Plot 3.—The trees generally were weak and many fruit spurs had developed. A severe heading back will be necessary to induce a more vigorous growth.

Plot 4.—These trees have made little growth during the two years planted, are full of fruiting spurs and are stunted in appearance which will make it necessary to do severe pruning in order to induce vigorous growth.

EXPERIMENT TO DETERMINE THE VALUE OF FERTILIZING APPLE TREES WHEN PLANTED.

In order to obtain some information relative to the profitable use of a complete commercial fertilizer, nitrate of soda, or stable manure, for inducing a vigorous start of apple trees when first planted, a series of tests was started in the spring of 1913 using four varieties of apples of uniform grade on land which was practically uniform throughout.

The complete fertilizer used was home mixed and contained 4 per cent nitrogen, 8 per cent phosphoric acid, and 10 per cent potash; made up of nitrate of soda, acid phosphate and muriate of potash. This was used at the rate of 600, 1,200, 1,800, 2,400 and 3,000 pounds per acre. Nitrate of soda at the rate of 600 and 1,200 pounds per acre was also used on a series of plots, and manure at the rate of 15 tons per acre was used on another series.

On one half of the trees the fertilizer was scattered around the tree after it was set and worked into the soil by again digging the latter to a depth of 3 inches. On duplicate plots the fertilizer was thoroughly mixed with the soil dug out for planting

the tree. In each case, in order to make the experiment uniform, one square yard of soil to a depth of 10 inches was removed for planting the tree in, and one square yard of the soil was fertilized.

Four varieties of apples, Ribston, Milwaukee, Stark and Roxbury Russet (Nonpareil) were planted, and two trees of each were used in each experiment. The trees were two years' old and were selected stock of uniform grade. The trees were set 10 feet apart each way.

Measurements were made of all the wood growth of the branches on each tree for the years 1913 and 1914. The data given is the average number of inches of growth made by the eight trees in each plot of four varieties, two trees of each.

One of the objects of the test was to find out whether the application of large amounts of fertilizers would cause injury, it being anticipated that such would be the case. There was little difference, however, in the appearance of the trees over the whole block, and while the measurements show that the excessive use of fertilizers decreased growth slightly yet it cannot be said that there was injury. It would appear, however, that the trees were not helped by the fertilizers applied, and that with good cultivation the application of fertilizers to young trees is not necessary.

It is quite a common practice for those starting young orchards to fertilize the tree when it is set or soon after, and although the quantity used per acre around each tree is not large, yet the quantity used per acre fertilized is often much greater than the largest amount used in this test. If 2 ounces are used per square yard, the rate is 600 pounds per acre, and if ½ pound is used on a surface of one square yard the rate per acre is 2,400 pounds.

How trees were fertilized and growth in 1913 and 1914:—

How Fertilized.	Average Growth in Inches. 1913.	1914.
Scattered on the surface after planting and worked in to a depth of 3 inches.		
No. 1, 600 pounds per acre	7·6	21·1
No. 2, 1,200 pounds per acre	6·0	21·6
No. 3, 1,800 pounds per acre	5·7	22·0
No. 4, 2,400 pounds per acre	6·1	20·0
No. 5, 3,000 pounds per acre	6·5	21·2
Mixed with the soil dug out for planting the tree in.		
No. 6, 600 pounds per acre	7·2	22·8
No. 7, 1,200 pounds per acre	6·6	19·5
No. 8, 1,800 pounds per acre	5·2	16·6
No. 9, 2,400 pounds per acre	3·6	17·0
No. 10, 3,000 pounds per acre	4·3	14·2
No. 11, Nitrate of soda, 600 pounds per acre spread on surface after planting and worked in to a depth of 3 inches	5·4	22·6
No. 12, Nitrate of soda, 1,200 pounds per acre spread on surface after planting and worked in to a depth of 3 inches	5·8	18·7
No. 13, Check, no fertilizer	5·7	23·3
No. 14, Manure, 6 pounds per tree, at rate of 15 tons per acre worked into soil after tree was planted	8·6	20·7
No. 15, Manure, 6 pounds per tree, at rate of 15 tons per acre worked into soil dug out for planting the tree.	8·3	18·8

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POTATOES.

Thirty-eight varieties of potatoes were planted in plots of two rows, each 66 feet long and 33 inches apart, or 1/120 acre each. They were planted May 28. Oats were grown on this ground the previous season, and as the land had been cleared of stumps the year previous to the oat crop, this was the first hoed crop it had produced. The soil was naturally a poor sandy loam, and up to this crop had not received fertilizer. The ground was ploughed in the fall and again in the spring and well worked. Bone meal at the rate of 400 pounds per acre was sown broadcast; also a complete fertilizer made up of 75 pounds nitrate of soda, 75 pounds sulphate of ammonia, 120 pounds muriate of potash, and 320 pounds 15 per cent acid phosphate. This made a fertilizer containing 4 per cent nitrogen, 8 per cent phosphorus and 10 per cent potash, applied at the rate of 600 pounds per acre, which was harrowed in before planting.

The sets were cut to three eyes to a piece, and were planted 14 inches apart in the rows. The plants were sprayed three times with Bordeaux mixture and twice with Paris green, using 1¼ pounds Paris green and 3 pounds arsenate of lead to 100 gallons.

The crop was harvested October 7. The yield was extremely light throughout. The plots for the most part lacked vigour and seemed to make a poor start, due, no doubt, to lack of humus in the soil.

Name.	Marketable.	Not Marketable.	Total Yield.
	Bushels.	Bushels.	Bushels.
Carman No. 1	136	19	155
Wee McGregor	125	25	150
Conquering Hero	110	40	150
Dreer Standard	128	20	148
Sir Walter Raleigh	127	20	147
Todd Wonder	129	10	139
McIntyre	109	29	138
Green Mountain	94	41	135
New Queen	109	23	132
Bovee	105	19	124
Rawlings Kidney	93	29	122
Gold Coin	94	26	120
Table Talk	84	36	120
Factor	85	33	118
Early White Albino	100	16	116
Up-to-Date	102	12	114
Irish Cobbler	80	33	113
Silver King	89	20	109
Empire State	89	20	109
Scottish Triumph	79	27	106
Eureka Extra Early	64	40	104
Irish Cobbler	87	14	101
Clyde	87	13	100
Morgan Seedling	89	10	99
Manistee	88	9	97
Dalmeny Hero	75	22	97
The Scott	70	26	96
Acquisition	66	30	96
Dobbie Prolific	77	16	93
Snow	70	19	89
Early Norther	74	9	83
Early Hebron	63	17	80
Houlton Rose	71	6	77
Pan American	71	5	76
New Scotch Rose	63	13	76
Burpee Extra Early	62	11	73
Early Rose	70	2	72
Early May	60	3	63

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FERTILIZER EXPERIMENTS IN THE GREENHOUSE.

For the purpose of getting additional information as to the plant food requirements of our soils a series of tests were made in the greenhouse with fertilizers of different kinds on a virgin soil taken from a newly cleared field to a depth of 6 inches.

The soil was thoroughly mixed to render it entirely uniform and placed in a bench 5 inches deep. Each plot of one square yard was divided by a board across the bench to keep each plot entirely separate.

Where the lime was used it was first applied and well worked into the soil, after which the other fertilizer used in the plot was scattered evenly over the surface and also worked into the soil.

Peas were used in this test. The seed was planted in openings made one inch deep in rows one and one-half inches apart. The seed was sown February 6th, and owing to the bench room being required 100 plants from each plot were lifted and weighed March 30.

An examination of the table given herewith leads us to believe that the newly broken land at this Station is decidedly deficient in phosphorus. It will be seen that the fertilized plots on which no phosphorus was used produced growth very little better than the check plots not fertilized. Lime is also lacking, but it will be seen that the good effect of lime is not apparent until the phosphorus has been supplied. Lime of itself gave little increase over the check plots but lime with either the acid phosphate or slag very materially increased the growth. Wherever lime was used along with a fertilizer containing phosphorus the colour of the foliage was very much darker and more healthy looking than where no lime was used.

Nitrate of soda when used alone did not increase growth. but when combined with phosphorus either in the form of acid phosphate or basic slag the crop was materially increased; and when combined with acid phosphate or slag and lime the crop was the best of any in the series in vigour and colour of foliage.

The applications were at the following rates:—

	Pounds.
Ground limestone	2,000
Basic slag	600
Acid phosphate	450
Nitrate of soda	150
Muriate of potash	150

Tests were started at the same time with oats on a similar soil and the results were practically the same in every particular, furnishing quite conclusive evidence that phosphorus is the limiting factor in our soil fertility.

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FERTILIZER Experiments with Peas.

Plot.	How Fertilized.	Pounds per acre.	Height in inches.	Weight of 100 plants.	Character of Foliage.
				Ounces.	
1.	Slag	600	8·5	7·25	Light green, no yellowing.
2.	No Fertilizer		6·5	6·5	Light green, no yellowing.
3.	Slag	600			
	Lime	2,000	10·0	7·75	Dark green, no yellowing.
4.	Lime	2,000	8·5	7·0	Light green, no yellowing.
5.	Acid Phosphate	450	16·5	9·75	Light green, much yellowing.
6.	Nitrate of Soda	150			
	Muriate of Potash	150			
	Lime	2,000	11·5	8·25	Light green, some yellowing.
7.	Acid Phosphate	450			
	Lime	2,000	18·0	12·75	Very dark green, no yellowing.
8.	No Fertilizer		7·5	7·0	Very light green, no yellowing.
9.	Slag	600			
	Nitrate of Soda	150			
	Muriate of Potash	150	16·5	10·75	Dark green, no yellowing.
10.	Slag	600			
	Nitrate of Soda	150			
	Muriate of Potash	150			
	Lime	2,000	18·0	12·75	Dark green, no yellowing.
11.	Slag	600			
	Nitrate of Soda	150	20·0	11·5	Dark green, no yellowing.
12.	Slag	600			
	Nitrate of Soda	150			
	Lime	2,000	17·0	10·75	Dark green, no yellowing.
13.	Slag	600			
	Muriate of Potash	150	19·0	11·0	Light green, slight yellowing.
14.	Slag	600			
	Muriate of Potash	150			
	Lime	2,000	16·5	13·25	Dark green, no yellowing.
15.	Acid Phosphate	450			
	Nitrate of Soda	150			
	Muriate of Potash	150	17·5	10·5	Light green, much yellowing.
16.	Acid Phosphate	450			
	Nitrate of Soda	150			
	Muriate of Potash	150			
	Lime	2,000	19·0	13·0	Dark green, slight yellowing.
17.	Acid Phosphate	450			
	Nitrate of Soda	150	17·0	9·0	Light green, much yellowing.
18.	Acid Phosphate	450			
	Nitrate of Soda	150			
	Lime	2,000	17·0	9·75	Dark green, slight yellowing.
19.	Acid Phosphate	450			
	Muriate of Potash	150	13·5	9·0	Light green, much yellowing.
20.	Acid Phosphate	450			
	Muriate of Potash	150			
	Lime	2,000	15·5	10·5	Dark green, no yellowing.
21.	No Fertilizer		8·5	6·0	Light green, no yellowing.
22.	Nitrate of Soda	150	9·5	7·5	Light green, slight yellowing.
23.	Nitrate of Soda	150			
	Lime	2,000	11·0	8·0	Dark green, no yellowing.
24.	Lime	2,000	8·5	6·5	Dark green, no yellowing.
25.	Muriate of Potash	150			
	Lime	2,000	9·0	8·0	Dark green, no yellowing.
26.	Muriate of Potash	150	7·0	6·5	Light green, slight yellowing.
27.	Acid Phosphate	450			
	Nitrate of Soda	300			
	Muriate of Potash	300	13·5	10·0	Light green, much yellowing.
28.	Nitrate of Soda	150			
	Muriate of Potash	150	9·0	8·0	Light green, much yellowing.
29.	Nitrate of Soda	150			
	Muriate of Potash	150			
	Lime	2,000	10·5	8·5	Light green, slight yellowing.
30.	No Fertilizer		8·0	6·0	Light green, no yellowihg.

EXPERIMENTAL ORCHARD WORK.

The experimental orchard work started at Berwick, Kings county, Nova Scotia; Falmouth, Hants county; and Bridgetown, Annapolis county, Nova Scotia, in 1913 was continued this year on the same orchards. Surveys made by this Station in 1912 and 1913 go to show that the greatest loss to fruit growers in Nova Scotia is due to the apple scab. This disease seems to thrive under the moist, cool climatic conditions of the province, and even where every apparent precaution is taken for the control of the disease by spraying with the usually recommended lime-sulphur, or Bordeaux mixture, the results have not been as one would expect. The orchard work therefore has been confined principally to problems associated with the application of fungicides for the control of the apple scab fungus.

The results from tests made in the various orchards go to show that thorough applications of either lime-sulphur or Bordeaux mixture applied at the proper time will practically control scab. Lime-sulphur is as good a fungicide as Bordeaux for the control of this disease. The lime-sulphur, however, is advisable after the blossoms fall owing to the Bordeaux mixture causing russeting which may materially lessen the value of the fruit. The application of a dormant strength of lime-sulphur while the trees are dormant seems to be unnecessary, and does not materially decrease the percentage of scab. The home-boiled lime-sulphur used at the same strength of diluted spray as the commercial concentrated is equally effective in the control of scab. The time of application is a factor of great importance, and in 1913 the spray put on just after the leaves had expanded was the most important. In 1914 the spray put on just before the blossoms opened was of the greatest value.

To delay the first spray until just before the blossom buds open is not safe. The period between the time when the leaf buds burst and the time when the blossoms open will vary according to the season. In 1913 the leaf buds expanded on Gravensteins in Berwick on April 28, and on May 17 the blossoms were beginning to unfold. In 1914 on the same variety the buds expanded May 16, and on May 28 the blossoms were beginning to unfold. It will be seen, therefore, that the time between the opening of the leaves and the opening of blossoms was one week longer in 1913 than in 1914. It would seem that much of the failure to control apple scab has been due to a too late application of the spray by not keeping the foliage well covered during the periods from the opening of the leaf buds to the opening of the blossoms. It is desirable that two applications should be given before the blossoms open in order to protect the foliage properly.

The kind of arsenate of lead is apparently a small factor in the control of scab. The different brands tested are apparently of equal value. The results from the use of lime-sulphur of different strengths would show that the strength 1·008 specific gravity, or one gallon concentrated lime-sulphur testing 1·28 specific gravity to 35 gallons of water is as effective, if thoroughly applied, as stronger solutions. Thoroughness of application is also an important factor. The top of the trees should be well sprayed The fruit should be well covered, and this can be done only by directing the spray to all parts of the tree.

Four to six trees of a variety were included in each test here tabulated. The trees in each test were given the same tillage and fertilization. The percentage of scab and the No. 1, No. 2 and No. 3 fruit was determined by sorting, counting and weighing the fruit when harvested. Some plots where the fruit crop was too light to be fairly comparable were eliminated. The experimental orchard work was con-

ducted at Falmouth and Berwick by Mr. Arthur Kelsall, and at Bridgetown by Mr. M. P. Pike, to whom I am indebted for much of the data given above, and I wish to thank them for carrying on the work, as directed, in a satisfactory manner.

THE DORMANT SPRAY.

The claim is made that a dormant spray of lime-sulphur is necessary to effectively control apple scab. A dormant spray is one put on before the leaf bud opens. The strength usually recommended is the 1·028 specific gravity, or 1 gallon concentrated lime-sulphur to 9 gallons water. This strength of mixture will take over half as much concentrated lime-sulphur as is required to make the four necessary applications after the foliage is on the trees, and only for the fact that a tree not in foliage takes less material to spray it than is required after the foliage is on, the concentrate used for this spray would be sufficient for all the subsequent sprays. It will be seen, therefore, that if there is no gain from this dormant spray for scab control, quite a saving of concentrate and labour in application will be effected. The dormant lime-sulphur spray is necessary for San Jose scale control, but for scab control it seems unnecessary.

The application put on by some growers just after the leaf buds unfold slightly should not be considered a dormant spray, and data as to the advantage of an application stronger than the usual 1 to 35 lime-sulphur at this time is given further on under the heading " Strength of Application."

KENTVILLE.

LIME-SULPHUR APPLIED AT DIFFERENT DATES.

Variety.	Dormant before leaves opened.	Leaf buds partially open.	Before blossoms open.	After petals fall.	2nd spray after petals fall.	3rd spray after petals fall.	Per cent scab.	Per cent packed out, 1 and 2.	Per cent insect injury to fruit.
	April 25.	May 18.	May 28.	June 9.	June 27.	July 19.			
Gravenstein at Berwick.	1·014	1·008	1·008	1·008	1·008	1·008	0·76	92·59	1·52
	1·014	1·008	1·008	1·008	1·008	......	4·3	92·01	1·45
	No spray..	......	......	......	......	......	75·44	21·06	3·97
	1·014	1·008	1·008	1·008	......	......	1·12	96·99	1·88
	1·014	1·008	1·008	......	......	......	8·5	90·82	2·13
	1·014	1·008	......	......	......	......	51·79	54·54	2·62
	1·014	......	1·008	......	......	......	9·51	88·89	2·42
	......	......	1·008	1·008	1·008	......	2·28	98·31	1·50
	No spray..	......	......	......	......	......	60·98	39·06	9·38
King at Berwick......	1·028	1·008	1·008	1·008	1·008	......	0·00	98·9	1·1
	1·014	1·008	1·008	1·008	1·008	......	1·06	97·56	1·32
	1·009	1·008	1·008	1·008	1·008	......	0·37	98·81	1·21
	......	1·008	1·008	1·008	1·008	......	0·00	98·88	3·26
	......	1·008	1·008	1·008	......	......	1·51	94·42	2·79
	......	1·008	1·008	......	......	......	2·98	90·91	3·15
	......	1·008	......	......	......	......	20·66	70·14	8·64
	No spray..	......	......	......	......	......	34·91	57·15	8·73
	......	......	1·008	1·008	1·008	1·008	0·86	98·9	2·54
	......	......	1·008	1·008	1·008	......	1·07	94·34	2·82
	......	......	1·014	1·008	1·008	1·008	0·00	96·77	2·78
	......	......	1·009	1·008	1·008	1·008	0·00	95·0	2·13
	......	......	1·014	1·008	......	......	0·77	95·0	2·31
	......	......	1·009	1·008	......	......	1·92	93·75	2·9
	April 30.		May 25.	June 16.	July 4.				
Golden Russet at Falmouth.	1·28	......	1·009	1·008	1·008	......	2·67	87·04	0·88
	......	......	1·009	1·008	1·008	......	4·71	85·72	1·83
	No spray..	......	......	......	......	......	37·74	53·33	9·28
	......	......	1·014	1·008	1·008	......	7·42	87·09	1·61
	......	......	1·028	1·008	1·008	......	0·49	85·71	3·89
	......	......	1·028	1·008	......	......	9·44	76·66	9·98
	......	......	......	1·008	1·008	......	16·57	71·74	4·59
	No spray..	......	......	......	......	......	31·28	56·25	13·65
Ben Davis at Falmouth.	1·28	......	1·009	1·008	1·008	......	0·61	88·14	1·39
	......	......	1·009	1·008	1·008	......	1·2	86·8	2·39
	No spray..	......	......	......	......	......	30·35	57·9	11·48
	......	......	1·014	1·008	1·008	......	0·71	90·0	0·36
	......	......	1·028	1·008	1·008	......	0·00	89·99	1·09
	......	......	1·028	1·008	......	......	0·36	90·91	4·14
	No spray.	......	......	......	......	......	36·74	51·11	10·62
	......	......	......	1·008	1·008	......	2·2	85·11	4·0
Gravenstein at Falmouth.	1·28	......	1·009	1·008	1·008	......	0·4	99·0	0·86
	......	......	1·009	1·008	1·008	......	1·35	98·0	1·12
	No spray..	......	......	......	......	......	52·22	44·12	6·91
	......	......	1·014	1·008	1·008	......	0·24	99·0	0·50
	......	......	1·028	1·008	1·008	......	1·16	98·84	1·16
	......	......	1·028	1·008	......	......	2·49	93·75	2·75
	No spray..	......	......	......	......	......	74·46	14·59	3·82
	......	......	......	1·008	1·008	......	9·88	88·23	1·74

KENTVILLE.

LIME-SULPHUR APPLIED AT DIFFERENT DATES.—*Concluded.*

Variety.	Dormant before leaves opened.	Leaf buds partially open.	Before blossoms open.	After petals fall.	2nd spray after petals fall.	3rd spray after petals fall.	Per cent scab.	Per cent packed out, 1 and 2.	Per cent insect injury to fruit.
	April 25.	May 18.	May 28.	June 9.	June 27.	July 19.			
King at Falmouth....	1·28	....	1·009	1·008	1·008	......	0·96	95·2	1·94
	....	....	1·009	1·008	1·008	......	1·63	88·99	2·33
	No spray..	......	....	....	....	......	38·37	57·7	11·40
	....	....	1·014	1·008	1·008	....	0·51	95·24	3·57
	....	....	1·028	1·008	1·008	....	1·93	90·39	1·84
	....	....	1·028	1·008	....	....	3·61	92·6	3·80
	No spray..	....	....	....	....	....	38·71	57·97	10·88
	....	......	1·008	1·008	....	....	12·3	80·0	4·41
	April 24.	May 15.	May 28.	June 9.					
Gravenstein at Bridgetown.	....	1·014	1·008	1·008	....	....	3·00	....	....
	1·03	1·008	1·008	1·008	....	....	6·23	....	....
	....	1·008	1·008	1·008	....	....	3·42	....	....
	....	1·014	1·008	1·008	....	....	8·70	....	....
	No spray..	....	....	....	....	....	57·62	....	....
			May 24.						
	....	....	1·008	1·008	....	....	10·25	....	....
	April 24.	May 23.	May 28.	June 15.	June 25.				
King at Bridgetown..	1·03	1·008	1·008	1·008	1·008	....	0·45	....	....
	....	1·008	1·008	1·008	1·008	....	1·70	....	....
	No spray..	....	....	....	....	....	32·26	....	....
	April 24.	May 20.	May 28.	June 10.	June 27.				
Gravenstein at Berwick, Ilsley Orchard.	1·028	1·008	1·008	1·008	1·008	....	6·87	90·2	2·26
	....	1·008	1·008	1·008	1·008	....	4·67	91·67	2·18
	....	....	1·008	1·008	1·008	....	2·37	90·5	1·14
	No spray..	....	....	....	....	....	24·98	71·43	8·39
Ben Davis at Berwick, Illsley Orchard.	1·028	1·008	1·008	1·008	1·008	....	0·22	90·9	0·43
	....	1·008	1·008	1·008	1·008	....	1·86	89·85	0·62
	....	....	1·008	1·008	1·008	....	1·1	92·31	0·22
	No spray..	....	....	....	......	....	3·39	85·7	2·19

NOTE.—Arsenate of lead at the rate of 5 pounds to 100 gallons was added to all the above sprays except the dormant ones. The "Niagara" brand concentrated lime-sulphur testing 1·28 specific gravity was used in all the experiments. Sprays of any density desired may be obtained from any concentrate by simply getting the density of the concentrate, dividing the decimal of this reading by the decimal of the spray desired and making the dilution indicated. For example, if the reading of the concentrate is 1·28, to get a spray of ·028 density divide the ·28 density by ·028 and obtain ten. This is the total dilution required, and it is obtained by adding nine volumes of water.

1·028-1 to 10 or 1 gallon concentrate to 9 gallons water.
1·014-1 to 20 or 1 " " 19 "
1·009-1 to 31 or 1 " " 30 "
1·008-1 to 35 or 1 " " 34 "
1·007 1 to 40 or 1 " " 39 "

KENTVILLE.

TIME OF APPLICATION.

Data given below show that in 1913 the application put on just after the leaf buds had unfolded was the most important. The spring was unusually early in 1913 and all the sprays given were put on after the leaf buds had opened. The weather apparently favoured the formation and distribution of spores in the dead leaves at an early date and the spraying at that time protected the opening foliage from infection. The leaf buds were as far advanced at the Berwick orchard on the 28th April, as at the Falmouth orchard on May 9.

GRAVENSTEIN, BERWICK, 1913.

Dates of Spraying.		Per cent. scab.	Per cent. Nos. 1 and 2.
Before blossoms.	After blossoms.		
April 28, May 17	June 6, June 20	10·70	81·49
May 3, May 17	June 6, June 20	15·85	81·60
May 17	June 6, June 20	32·56	64·29
No Spray		97·83	4·07

GRAVENSTEIN, FALMOUTH, 1913.

Before blossoms.	After blossoms.	Per cent. scab.	Per cent. Nos. 1 and 2.
May 7, May 21	June 12, June 23, July 14	3·52	94·68
May 9	June 12, June 23	4·88	85·65
May 21	June 12, June 23	20·54	64·93
May 9	June 12, June 23, July 14	15·85	79·39
	June 12, June 23, July 14	83·63	5·13
No Spray		87·35	11·25

GOLDEN RUSSET, FALMOUTH, 1913.

Before blossoms.	After blossoms.	Per cent. scab.	Per cent. Nos. 1 and 2.
May 9, May 21	June 12, June 23.	4·85	90·00
May 9, May 21	June 12, June 23, July 14	4·53	94·25
May 9	June 12, June 23	5·24	89.48
May 21	June 12, June 23	24·71	71·90
May 9	June 12, June 23, July 14	9·80	86·49
No spray		60·79	36·96

SPY, FALMOUTH, 1913.

Before blossoms.	After blossoms.	Per cent. scab.	Per cent. Nos. 1 and 2.
May 9	June 12, June 23, July 14	2·30	88·55
	June 12, June 23, July 14	65·68	25·73
No spray		62·81	34·67

The spring of 1914 was considerably later, and as a consequence the period of worst infection was later, hence the early sprays were not so necessary. The results as tabulated below would go to show that the spray put on just before the blossoms opened was of more value in controlling the apple scab. The work covering the two years would go to show that sufficient attention has not been given to the keeping of the foliage well covered with spray up to the blossoming period, and that a lot of the failure to control scab was due to this. It seems advisable, therefore, to make two applications before the blossom buds open, one just after the leaf buds are about half an inch out and another before the blossoms open. In seasons like that of 1914, when the opening of the blossom buds closely follows the unfolding of the leaf buds, one spray about midway between the two may give the protection desired.

KENTVILLE.

It should be kept in mind, however, that the later sprays cannot be safely omitted, especially the spray after the petals fall. It will be noticed in the following table that in the tests with King, Greening and Spitzenburg at Falmouth, which were large trees closely planted, that the applications after the petals fell were of the greatest importance for scab control.

Variety.	Dormant before leaves open.	Leaf buds partially open.	Before blossoms open.	After petals fall.	—	Per cent scab.	Per cent packed out 1 and 2.
		May 22.	May 30.	June 13.	July 3.		
King at Falmouth		1·008		1·008	1·008	0·23	92·02
			1·008	1·008	1·008	0·00	91·67
				1·008	1·008	0·00	93·44
	No spray					9·98	81·82
Greening at Falmouth		1·008		1·008	1·008	0·32	91·23
				1·008	1·008	2·49	89·7
	No spray					56·52	40·87
Spitzenburg at Falmouth		1·008		1·008	1·008	0·55	94·59
				1·008	1·008	4·21	83·33
	No spray					75·5	20·21
	April 25.	May 18.	May 28.	June 9.	June 24.		
Gravenstein at Berwick	1·014	1·008	1·008	1·008	1·008	4·3	92·01
	1·014	1·008	1·008	1·008		1·12	96·99
	1·014	1·008	1·008			8·5	90·82
	1·014	1·008				51·79	54·54
	1·014		1·008			9·51	88·89
			1·008	1·008	1·008	2·28	98·31
	No spray					60·98	39·06
King at Berwick		1·008	1·008	1·008	1·008	0·00	98·88
		1·008	1·008	1·008		1·51	94·42
		1·008	1·008			2·98	90·91
		1·008				20·66	70·14
	No spray					34·91	57·15
		May 23.	May 28.	June 15.	June 25.		
Ben Davis at Berwick		1·008	1·008	1·008	1·008	1·86	
			1·008	1·008	1·008	1·1	
	No spray					3·39	
		May 22.	May 28.	June 15.	June 24.		
Baldwin at Bridgetown		1·008	1·008	1·008	1·008	1·32	
			1·008	1·008	1·008	0·42	
	No spray					12·5	
		May 15.	May 28.	June 9.			
Gravenstein at Bridgetown		1·008	1·008	1·008		3·42	
			May 24.				
			1·008	1·008		10·25	
	No spray					57·62	

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THE STRENGTH OF LIME-SULPHUR TO USE.

To determine whether there is any advantage in using a stronger lime-sulphur than the regular 1·008 mixture for the first applications a series of tests were made. This work follows up that started last year when it was found that the 1·008 mixture thoroughly applied seemed to be strong enough to give the desired protection. The results this season would go to prove that the 1·008 mixture 1 to 35 will control scab equally as well as the stronger sprays.

Variety.	Before blossoms open.	After petals fall.	—	—	Per cent. scab.	Per cent. packed out No. 1, 2.
King at Berwick.	May 28.	June 10.	June 24.	July 10.		
	1·014	1·008	1·008	1·008	0·00	96·77
	1·009	1·008	1·008	1·008	0·00	95·00
	1·008	1·008	1·008	1·008	0·86	98·9
	No spray				34·91	57·15
Ben Davis at Falmouth	May 25.	June 15.	July 4.			
	1·028	1·008	1·008		0·00	89·99
	1·014	1·008	1·008		1·71	90·0
	1·009	1·008	1·008		1·2	86·8
	No spray				35·74	51·11
Gravenstein at Falmouth.	1·028	1·008	1·008		1·16	98·84
	1·014	1·008	1·008		0·24	99·00
	1·009	1·008	1·008		1·35	98·00
	No spray				74·46	14·59
King at Falmouth	1·028	1·008	1·008		1·93	90·39
	1·014	1·008	1·008		0·51	95·24
	1·009	1·008	1·008		1·63	88·99
	No spray				38·71	57·97
Gravenstein at Bridgetown	May 15.	May 28.	June 9.			
	1·014	1·008	1·008		3·00	
	1·008	1·008	1·008		3·42	
	No spray				32·26	
Northern Spy at Berwick.		June 2.	June 23.	July 10.		
		1·009	1·009	1·009	0·18	92·48
		1·008	1·008	1·008	0·15	94·2
		1·007	1·007	1·007	0·00	95·24
		1·014	1·008	1·008	0·00	93·33
	No spray				73·27	20·0

NOTE.—Arsenate of lead 5 lbs. to 100 gallons was used in all the above sprays. The same brand of lime-sulphur was used throughout.

KENTVILLE.

BORDEAUX MIXTURE *versus* LIME-SULPHUR.

Tests were conducted to determine the relative value of Bordeaux as compared with lime-sulphur as a fungicide for the control of scab. The results would go to show that lime-sulphur is equally as effective as Bordeaux. Notes were made on the russeting of the fruit and it will be seen that russeting followed the use of Bordeaux when applied after the blossoms fell. Sprays applied before the blossoms opened, as we would expect, caused no russeting. The russeting of fruit was not bad this season and did not so materially affect the quality of the fruit for market as was the case last season.

Tests were also made of copper sulphate solution, 1 pound copper sulphate to 15 gallons water, put on when the trees were dormant, and also the 3-3-40 Bordeaux, namely 3 pounds copper sulphate, 3 pounds lime, to make 40 gallons, applied when the trees were dormant. The results would seem to show that this dormant spray is of little value. The 4-4-40 Bordeaux was apparently as effective as the 3-3-40 Bordeaux in the control of scab.

Variety.	Dormant spray April 25.	When leaf buds were partially opened.	Before blossoms opened.	After petals fall.	Second spray after petals fall.	Per cent scab.	Per cent packed out, 1 and 2.	Per cent russet.
		May 18	May 28	June 9	June 24			
Gravenstein, at Berwick Chute Orchard.	1 to 15	4–4–40	4–4–40	1·008	1·008	5·64	95·45	0·00
	3–3–40	3–3–40	3–3–40	1·008	1·008	5·51	93·83	0·00
	....	4–4–40	4–4–40	1·008	1·008	1·8	94·28	0·00
	....	....	4–4–40	1·008	1·008	1·21	93·1	0·00
	....	....	3–3–40	1·008	1·008	3·4	95·38	0·00
	1·014	1·008	1·008	1·008	1·008	4·3	92·1	0·00
	....	1·008	1·008	1·008	1·008	5·52	91·3	0·00
	No spray.	....	....	....	....	75·44	21·06	0·00
		May 21	May 29	June 11	June 29			
Gravenstein, at Berwick Illsley Orchard.	....	4–4–40	4–4–40	1·008	1·008	6·93	90·0	4·24
	....	3–3–40	3–3–40	3–3–40	3–3–40	3·59	92·3	89·51
	....	4–4–40	4–4–40	4–4–40	4–4–40	2·2	90·9	94·49
	No spray.	....	....	....	....	24·98	71·43	5·89
	....	1·008	1·008	1·008	1·008	4·67	91·67	6·44
Ben Davis, at Berwick.	....	4–4–40	4–4–40	1·008	1·008	1·0	93·75	1·69
	....	3–3–40	3–3–40	3–3–40	3–3–40	0·45	86·67	35·38
	April 25	May 21	May 29	June 11	June 29			
Illsley Orchard........	No spray.	....	....	....	....	3·39	85·7	1·2
	....	1·008	1.008	1·008	1·008	1·86	89·85	0·42
			May 25	June 13	July 2			
Gravenstein, at Falmouth.	....	....	3–3–40	3–3–40	3–3–40	0·09	90·91	84·35
	....	....	4–4–40	4–4–40	4–4–40	0·00	98·04	81·08
	....	....	4–4–40	1·008	1·008	0·00	97·67	2·64
	....	....	1·008	1·008	1·008	0·63	97·44	3·30
	No spray.	....	....	....	....	18·47	82·45	2·54
Spy, at Falmouth.....	....	....	3–3–40	3–3–40	3–3–40	1·34	87·72	1·15
	....	....	4–4–40	4–4–40	4–4–40	0·32	83·87	1·19
	....	....	4–4–40	1·008	1·008	0·95	80·0	0·38
	....	....	1·008	1·008	1·008	0·00	86·2	0·23
	No spray.	....	....	....	....	30·77	62·5	0·00

KENTVILLE.

BORDEAUX MIXTURE *versus* LIME-SULPHUR.—*Concluded.*

Variety.	Dormant spray April 25.	When leaf buds were partially opened.	Before blossoms opened.	After petals fall.	Second spray after petals fall.	Per cent scab.	Per cent packed out, 1 and 2.	Per cent russet.
Russet, at Falmouth..	....	....	3-3-40	3-3-40	3-3-40	0·16	92·06	0·00
	....	....	4-4-40	4-4-40	4-4-40	0·0	93·75	0·00
	....	....	4-4-40	1·008	1·008	0·2	93·22	0·00
	....	....	1·008	1·008	1·008	0·5	93·44	0·00
	No spray.	....	....	....	....	5·28	86·21	0·00
		May 20	May 28	June 10				
King, at Bridgetown..	....	4-4-40	4-4-40	1·008	....	0·63	....	0·00
	....	1·008	1·008	1·008	....	1·70	....	0·00
	No spray.	....	....	....	....	32·26	....	0·00

NOTE.—Dormant spray 1 to 15 represents 1 gallon copper sulphate to 15 gallons of water. 3-3-40 represents Bordeaux made of 3 pounds copper sulphate 3 pounds lime, and 40 gallons water. 4-4-40 represents 4 pounds copper sulphate, 4 pounds lime and 40 gallons water, 1·008 represents the regular lime-sulphur spray, 1 gallon concentrate to make 35 gallons. Arsenate of lead 5 pounds to 100 gallons was used in all the above sprays.

SACCHARATED BORDEAUX.

Representation had been made to the Department that by the addition of sugar to the regular Bordeaux mixture russeting of the fruit which usually accompanies the use of Bordeaux would not take place, accordingly a series of tests were conducted at Falmouth to determine whether such was the case.

Common brown sugar was dissolved and added to the Bordeaux mixture after it had been prepared. To one plot 6 pounds was added to 40 gallons, to another 4 pounds to 40 gallons, and to another 2 pounds to 40 gallons. The results as tabulated below show that sugar does not lessen russeting, and also that it has apparently no influence on the efficiency of Bordeaux as a fungicide.

Variety.	Sprayed May 26.	Sprayed June 15.	Sprayed July 4.	Per cent scab.	Per cent russet.	Packed out 1 & 2.
Gravenstein at Falmouth.	4-4-6-40	4-4-6-40	4-4-6-40	0·47	95·25	88·89
	4-4-4-40	4-4-4-40	4-4-4-40	0·11	79·26	90·48
	4-4-2-40	4-4-2-40	4-4-2-40	0·33	82·76	91·55
	4-4-40	4-4-40	4-4-40	0·00	81·08	98·04
	No spray.	....	....	18·47	2·54	82·45
	1·008	1·008	1·008	0·63	3·03	97·44
Northern Spy at Falmouth	4-4-6-40	4-4-6-40	4-4-6-40	0·00	7·35	90·32
	4-4-4-40	4-4-4-40	4-4-4-40	0·85	6·36	79·41
	4-4-2-40	4-4-2-40	4-4-2-40	0·87	4·77	86·2
	4-4-40	4-4-40	4-4-40	0·32	1·9	83·87
	No spray.	....	....	30·77	0·0	62·5
	1·008	1·008	1·008	0·00	0·23	86·2

NOTE.—4-4-6-40 represents a spray containing 4 pounds lime, 4 pounds copper sulphate, 6 pounds sugar to make 40 gallons. 4-4-4-40 represents a spray containing

4 pounds lime, 4 pounds copper sulphate, 4 pounds sugar to make 40 gallons. 4-4-2-40 represents 4 pounds lime, 4 pounds copper sulphate, 2 pounds sugar to make 40 gallons. 4-4-40 represents the regular Bordeaux, 4 pounds lime, 4 pounds copper sulphate to make 40 gallons. 1·008 represents the regular lime-sulphur spray. 1 gallon concentrate to make 35 gallons.

COMMERCIAL CONCENTRATE *versus* HOME MADE CONCENTRATED LIME-SULPHUR.

Tests were again conducted to determine the relative efficiency of the commercial as compared with the home made concentrated lime-sulphur. The results obtained as given in the table below would show that home made concentrated at the same density is as effective for scab control as the commercial concentrated.

Variety.	Mixture.	Before blossoms open.	After petals fall.		Per cent scab.	Per cent packed out No. 1 & 2.
		June 2.	June 23.	July 10.		
Spy at Berwick	Commercial	1·009	1·009	1·009	0·18	92·48
	Home-boiled	1·009	1·009	1·009	0·00	93·23
	Commercial	1·008	1·008	1·008	0·15	94·2
	Home-boiled	1·008	1·008	1·008	9·00	92·59
	Commercial	1·007	1·007	1·007	0·00	95·24
	Home-boiled	1·007	1·007	1·007	0·98	95·24
	No spray	....	....	....	73·27	20·0
		May 25.	June 20.	July 6.		
Gravenstein at Falmouth	Commercial	1·009	1·008	1·008	1·35	98·09
	Home-boiled	1·009	1·008	1·008	0·77	99·0
	No spray	....	....	....	52·22	44·12
King at Falmouth	Commercial	1·009	1·008	1·008	1·63	88·09
	Home-boiled	1·009	1·008	1·008	1·23	93·44
	No spray	....	....	....	38·37	57·7
Ben Davis at Falmouth	Commercial	1·009	1 00	1·008	1·2	86·8
	Home-boiled	1·009	1 00	1·008	0·35	92·16
	No spray	....	....	....	30·35	57·9
		Before May 23.	Before May 28.	June 15.	June 25.	Per cent scab.
Gravenstein at Bridgetown	Commercial	1·008	1·008	1·008	1·008	1·70
	Home-boiled	1·008	1·008	1·008	1·008	1·84
	No spray	....	....	....	....	32·26

ARSENATE OF LEAD IN LIME-SULPHUR FOR CONTROL OF SCAB.

Arsenate of lead added to the lime-sulphur spray is considered to greatly increase its fungicidal value. A series of tests to get additional information as to the actual gain from its use for the control of scab was undertaken. Arsenate of lead is necessary for the control of insects and for this reason cannot be left out of our sprays. Its value as a fungicide, however, has apparently been over-estimated, and it will be noticed that to increase the amount of arsenate of lead may not necessarily increase the effectiveness of the spray. It will be noticed that dry arsenate of lead, 2 pounds to 100 gallons, was equally as effective as 5 pounds paste lead to 100 gallons.

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All plots were sprayed at the same time, May 25, June 20, and July 6, with the same strength lime-sulphur 1·009 specific gravity for the first spray and 1·008 for the next two applications. This test was conducted at Falmouth.

Arsenate of Lead to 100 gallons of Lime-sulphur.	G. Russet p. c. scab.	Ben Davis p. c. scab.	Gravenstein. p. c. scab.	Ribston p. c. scab.	King p. c. scab.
7½ lb. neutral lead	4·33	1·31	0·06	1·19	no fruit.
5 lb. neutral lead	2·55	0·47	2·02	6·94	no fruit.
5 lb. acid lead	4·71	1·2	1·35	no fruit.	1·63
2½ lb. neutral lead	1·9	0·16	2·12	no fruit.	no fruit.
2 lb. dry lead	3·42	0·00	0·58	0·51	0·67
Lime-sulphur only	3·54	1·17	6·12	1·09	1·37
No spray	no fruit.	23·72	52·33	no fruit.	34·56

FROZEN LIME-SULPHUR.

A question frequently asked is whether lime-sulphur which has been stored in outbuildings and exposed to frost during the winter is safe to use. There seems to be no good reason why it should not be all right, but in order to secure reliable data as to whether its value was lessened a series of tests was made at Falmouth. The results would go to show that a spray of the same density made from concentrated lime-sulphur exposed to frost is as effective as the spray made from a concentrate lime-sulphur not exposed to frost.

Variety.	—	May 25.	June 20.	July 6.	Per cent scab	Per cent packed out No. 1 and 2.
Ben Davis at Falmouth	Frozen	1·009	1·008	1·008	1·2	89·17
	Not Frozen	1·009	1·008	1·008	1·2	86·8
	No spray	....	....	....	30·35	57·9
King at Falmouth	Frozen	1·009	1·008	1·008	0·52	90·
	Not Frozen	1·009	1·008	1·008	1·63	88·09
	No Spray	....	....	....	38·37	57·7

HOME-MADE ARSENATE OF LEAD.

A test was made of home prepared arsenate of lead as compared with the lead paste. The same strength of lime-sulphur was used and the applications were made on the same dates in each case. The home prepared arsenate of lead was made by dissolving 22 ounces of acetate of lead (sugar of lead) and 11 ounces of arsenate of soda each in one gallon of hot water, and after being dissolved they were poured simultaneously into the diluted lime-sulphur working the agitator at the same time. The above quantity was used for 40 gallons.

—	Per cent scab.	Per cent insect injury to fruit.	Per cent foliage injury from spray.
Home-made arsenate	7·8	2·32	3·0
Commercial "	4·6	2·18	2·6
No spray	24·98	8·39	0·0

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SOLUBLE SULPHUR COMPOUND.

Tests were made at Berwick and Falmouth with a soluble sulphur compound made by the Niagara Sprayer Company, Middleport, New York. The material used was that put out in 1913 and had directions for use on it which have since been considerably modified. The directions on the 1914 output were that three-quarters to one pound should be used to 50 gallons. Following the directions, however, on the can, 3½ pounds to 100 gallons were used for the first spray, and as the burning was very great this was dropped to 2½ pounds to 100 gallons for the second spray, and the later spray was put on with 2 pounds to 100 gallons. The latter application so far as we could determine did not cause injury to the foliage.

Sherwin and Williams arsenate of lead was used in the spray on one plot, Swift's arsenate of lead on one, and dry arsenate was also used on one in Berwick. The plots in Berwick did not produce fruit. Notes were made as to the foliage and insect injury on the plots as compared with those on which the regular spray was used. Soluble sulphur solution is apparently as adhesive as the regular spray, but is much less visible on the foliage after application. The spray was put on at Falmouth May 25, June 20, and July 6. The Berwick application was made May 21, June 1, June 12, and June 23.

Variety.	——	Per cent scab.	Per cent Codling moth injury.	Per cent other insect injury.
Gravenstein at Falmouth....	Soluble sulphur S. & W. arsenate....	6·29	0·1	0·62
	Soluble sulphur S...... "	6·05	0·0	0·38
	Lime sulphur S........ "	1·35	0·11	1·01
	No spray........................	52·22	2·03	4·88
King at Falmouth	Soluble sulphur S. & W. arsenate ...	0·85	0·42	1·9
	Soluble sulphur S...... " ...	0·22	0·43	0·87
	Lime sulphur S........ "	0·93	1·4	1·63
	No spray............................	3·02	8·38	38·37
Russet at Falmouth	Soluble sulphur S.& W. arsenate....	1·7	1·13	11·34
	Soluble sulphur S ..... "	0·54	0·81	6·77
	Lime sulphur S ...... "	0.61	1·22	4·71
	No spray	5·1	4·18	37·74
Ben Davis at Falmouth.....	Soluble sulphur S.& W. arsenate....	0·00	0·35	1·21
	Soluble sulphur S...... "	0·00	0·99	1·27
	Lime sulphur S.... .. "	1·03	1·36	1·2
	No spray.........................	2·69	8·79	30·35

FOLIAGE INJURY FROM SOLUBLE SULPHUR COMPOUND.

In order to get reliable information as to the exact foliage injury caused by the soluble sulphur compound as compared with lime-sulphur, a close examination was made of 500 leaves taken from each plot. The leaves selected were the older ones and ones which had evidently received all the sprays. The results given in the following table is the percentage of slight, medium, and bad injury as shown when the leaves were examined at the end of September.

It will be noticed that the Sherwin and Williams arsenate of lead which is supposed to be a lead arsenate made by the neutral process gives less injury than Swift's

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arsenate of lead which is said to be an acid process lead arsenate, and that dry arsenate of lead gave still less injury.

Variety.	—	Per cent slight injury.	Per cent medium injury.	Per cent bad injury.	Per cent total injury.
Gravenstein at Falmouth	Soluble sulphur and S.&W. arsenate	42·0	25·2	24·7	91·9
	" " and S. arsenate......	26·7	31·7	40·0	98·4
	Lime-sulphur and S. arsenate......	11·0	0·0	0·0	11·
	No spray....	0·0	0·0	0·0	0·0
Baldwin at Berwick....	Soluble sulphur and S.&W. arsenate	51·8	17·8	9·6	79·2
	" " and S. arsenate....	38·2	25·0	29·8	93·
	" " and dry arsenate...	50·0	15·2	10·2	75·4
	Lime-sulphur and S. & W. arsenate	1·0	0·0	0·0	1·0
	" " and S. arsenate.....	1·2	0·0	0·0	1·2
	" " and dry arsenate ...	0·8	0·0	0·0	0·8
	" " and Grasselli arsenate	1·2	0·0	0·0	1·2
	No spray...........	0·0	0·0	0·0	0·0

FOLIAGE INJURY AND RELATIVE ADHESIVENESS OF SPRAYS.

To determine the foliage injury and relative adhesiveness of different sprays a close examination was made of the foliage from plots given different amounts of arsenate of lead in the lime-sulphur as compared with plots on which no arsenate was used in the spray. The plots were all sprayed alike and at the same time. A general orchard survey of these plots revealed little difference as to injury or adhesiveness of these sprays.

The leaves selected for making observations were the older ones and ones which we considered would have received all the sprays put on during the season.

Four hundred leaves at Falmouth and 500 at Berwick, were closely examined from each plot at the end of September and the percentages of injury and percentages of adhesiveness as given on the following table represent the number of leaves showing injury or showing spray.

At Falmouth.	Per cent injury.	Per cent leaves showing spray.
L. S. and acid lead, 5 pounds to 100 gallons..............	10·0	93·5
L. S. and acid lead except last spray........	11·0	93·7
L. S. and neutral lead, $7\frac{1}{2}$ pounds per 100 gallons........	12·0	96·5
L. S. and neutral lead, 5 pounds per 100 gallons........	10·0	94·5
L. S. and neutral lead, $2\frac{1}{2}$ pounds per 100 gallons........	11·7	96·2
L. S. and no arsenate of lead........	10·5	95·0
L. S. and dry lead, 2 pounds to 100 gallons........	11·2	95·2
No spray........	0·0	0·0
At Berwick.		
L. S. and acid lead, 5 pounds to 100 gallons........	1·2	52·2
L. S. and neutral lead, 5 pounds to 100 gallons........	1·0	55·5
L. S. and dry lead, 2 pounds to 100 gallons........	0·8	63·2
L. S. and Grasselli, 5 pounds to 100 gallons........	1·2	51·8
L. S. no arsenate........	0·8	52·0
No spray........	0·0	0

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FOLIAGE INJURY FROM BORDEAUX—ARSENATE AND LIME SULPHUR—ARSENATE.

Notes were made of the foliage injury on the plots sprayed with Bordeaux, Saccharated Bordeaux and Lime-sulphur at Falmouth. Arsenate of lead was used in all the sprays at the rate of 5 pounds per 100 gallons. The trees were all sprayed on the same dates. The injury was not severe and consisted of black-brown spots, brown dead blotches, minute black-brown specks only visible on close inspection, and burning of the leaf edges, which was not sufficient to noticeably injure the trees. The trees had received the regular number of applications.

The leaves selected for examination were the older ones which had received all the sprays. The data given below was from 300 leaves of each plot at Falmouth and 500 from each plot at Berwick. The Bordeaux and Lime-sulphur plot was sprayed once with Bordeaux before the blossoms opened and afterwards with lime-sulphur.

Falmouth.	Per cent injury, Gravenstein.	Per cent injury, Northern Spy.	Per cent injury, Golden Russet
No spray	0·0	0·0	0·0
S. Bordeaux, 4-4-6-40	98·0	98·3	56·7
S. Bordeaux, 4-4-4-40	98·3	97·3	51·7
S. Bordeaux, 4-4-2-40	97·0	97·0	33·3
Bordeaux, 3-3-40	96·7	93·3	34·0
Bordeaux, 4-4-40	95·7	95·0	41·7
Bordeaux, 4-4-40, and lime sulphur, 1·008	10·3	0·0	0·7
Lime-sulphur, 1·008	9·7	0·0	0·0

Gravenstein at Berwick.	Per cent injury.	Nature of injury.
Lime-sulphur, 1·008. Home-made arsenate	3·0	Burning of leaf edge and brown blotches.
Lime-sulphur, 1·008. Swift's arsenate, 5 lbs. to 100 gallons	2·6	" "
Bordeaux, 4-4-40 before blossoms open, and lime sulphur 1·008 after petals fall. Swift's arsenate, 5 lbs. to 100 gallons	2·6	" "
Check, no spray	0·0	None.
Bordeaux, 3-3-40. Swift's arsenate, 5 lbs. to 100 gallons	69·2	Brown blotches and yellow leaf. Slight defoliation during fall.
Bordeaux, 4-4-40. Swift's arsenate, 5 lbs. to 100 gallons	74·8	" "

NOTE.—The home-made lead arsenate was made by dissolving 22 ounces acetate of lead, and 11 ounces arsenate of soda each in one gallon hot water in separate buckets. These two solutions were poured simultaneously into the diluted lime-sulphur mixture to make 40 gallons.

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INSECT INJURY WHERE DIFFERENT STRENGTHS OF ARSENATE OF LEAD WERE USED.

Records were made of insect injury to the fruit on the plots sprayed with different strengths of arsenate of lead. A count was made of the Codling moth injury, and also the injury from other insects. The percentage injury is given in the following table, the spraying was done May 25, June 20, July 6:—

Arsenate of lead to 100 gallons.	King.		Ben Davis.		Golden Russet.		Gravenstein.	
	Codling moth injury.	Other insect injury.	Codling moth injury.	Other insect injury.	Codling moth injury.	Other insect injury.	Codling moth injury.	Other insect injury.
7½ lb. neutral lead	no fruit.	no fruit.	0·00	1·31	0·96	1·22	0·00	0·91
5 lb. neutral lead	no fruit.	no fruit.	0·16	0·98	1·32	1·32	1·01	1·51
5 lb. acid lead	0·93	1·4	1·03	1·36	0·61	1·22	0·11	1·01
2½ lb. neutral lead	no fruit.	no fruit.	0·32	1·29	0·25	0·71	2·13	3·19
2 lb. dry lead	1·0	1·34	0·16	0·63	·95	0·19	0·00	0·89
Lime-sulphur only	5·5	3·21	3·93	2·95	3·07	3·68	2·58	2·26
No spray	7·43	4·95	4·18	1·91	5·1	4·8	1·31	5·17
Arsenate left out of last spray	2·56	3·07	1·38	1·89	no fruit.	no fruit.	0·81	0·92

A series of tests were made at Bridgetown with lime-sulphur arsenate and lime-sulphur with the following results:—

—	Insect Injury to fruit.	Per cent scab.
5 pounds S. & W. arsenate per 100 gallons	0·18	1·11
5 pounds S. arsenate per 100 gallons	1·69	1·32
Lime-sulphur only	4·64	0·00
No spray	3·12	12·5

THOROUGH SPRAYING.

Thorough spraying counts for a lot in apple scab control. It is rather difficult to do a thorough job at the top of a 30-foot tree. The following results were obtained from a count of the fruit on a tree that had been sprayed as the operator thought thoroughly:—

Top of tree.................................12 per cent scab.
Five feet from the top...................... 5 " " "
At the bottom............................... 2 " " "

It is interesting also to note that from records obtained we find that the larger proportion of scab on the sprayed trees is found at the calyx end of the apple. The percentage of side scab and calyx scab is about equal on unsprayed trees. This would seem to show that the spray should be directed as nearly as possible toward the calyx end of the apple.

—	Per cent total scab.	Per cent calyx scab.	Per cent side scab.
Unsprayed	52	27	25
Sprayed	8	7	1

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THINNING FRUIT.

Experiments to determine the value of thinning the fruit were continued this season at Bridgetown. The varieties Gravenstein and Roxbury Russet (Nonpareil) were used. The set of fruit was not great and uniform trees with as heavy a set of fruit as could be secured were used. As will be seen below the set of fruit was fairly uniform at the start of the experiment.

GRAVENSTEIN.

Average number of apples picked from unthinned trees	2,658
" " picked from thinned trees	2,328
" " removed	321
" " on thinned tree at start	2,649
Per cent of apples removed	12·1
Average number of apples per barrel, tree run, from unthinned trees	443
" " " " thinned trees	388

	Not thinned.	Thinned.
Per cent No. 1 fruit	77·88	89·29
" No. 2 "	12·93	6·60
" No. 3 "	6·39	4·11
" Cull "	2·80	

Taking 100 barrels tree run for comparison at the price of $2.50 for No. 1, $2 for No. 2, $1 for No. 3, and 25 cents for culls per barrel, we have the following:—

Not Thinned.			Thinned.		
Barrels.	Price per barrel.	Value.	Barrels.	Price per barrel.	Value.
77·88	$2·50	$194·70	89·29	$2·50	$223·22
12·93	2·00	25·86	6·60	2·00	13·20
6·39	1·00	6·39	4·11	1·00	4·11
2·80	0·25	0·70	......	......	......
		227·65			240·53

Difference in favour of thinning 100 barrels, $12.88.

ROXBURY RUSSET (NONPAREIL).

Average number of apples picked from unthinned trees	2,492
" " picked from thinned trees	2,668
" " removed	562
" " on thinned trees at start	3,230
Per cent of apples removed	17·4
Average number of apples per barrel, tree run, from unthinned trees	667
" " " " from thinned trees	623

	Not thinned.	Thinned.
Per cent No. 1 fruit	50·39	59·02
" No. 2 "	32·42	26·69
" No. 3 "	10·15	14·29
" Cull "	7·04	

Taking 100 barrels tree run for comparison at the prices given above we have the following:—

Not Thinned.			Thinned.		
Barrels.	Price per barrel.	Value.	Barrels.	Price per barrel.	Value.
50·39	$2 50	$125 97	59·02	$2 50	$147 55
32·42	2 00	68 84	26·69	2 00	53 38
10·15	1 00	10 15	14 29	1 00	14 29
7·04	0 25	1 75	....	....	....
		206 71			215 22

Difference in favour of thinning per 100 barrels, $8.51.

It will be noticed that these trees were not uniform in set of fruit. The thinned trees after the thinning was done had 176 more apples on than the unthinned. It was thought that the set was fairly uniform. We would expect little gain from thinning in this case although it will be seen that the No. 1 fruit is increased 8·63 per cent and that the thinning has paid at the rate of 8½ cents per barrel.

The cost of thinning will vary from 10 to 25 cents per barrel according to the size of the tree. The Gravensteins in the above experiment were large, rather high trees producing about 6 barrels of fruit and cost 25 cents per tree to thin, allowing wages at 20 cents per hour, this is approximately 4 cents per barrel. The Nonpareils cost 3 cents per barrel. The cost of thinning is somewhat offset in the cost of grading which is not so great in the thinned fruit.

The thinning was done during the last week in July.

FERTILIZER EXPERIMENTS AT BERWICK.

A block of Golden Russet apples comprising 48 trees was used for this experiment. The trees are on a sandy soil which is low in fertility. This variety generally is not a heavy producer and the object is to see whether increased fertilizing will materially increase the yield. Four trees are used in a test and the area of each plot is 1/15 acre.

The mixed fertilizer is made up of nitrate of soda, acid phosphate and muriate of potash. The dog fish scrap was obtained from the reduction works at Canso. It will be noticed that Plot No. 2 has the percentage of potash reduced one-half over Plot No. 1, and that Plot No. 3 has the acid phosphate and muriate of potash each reduced one-half over Plot No. 1. Plots Nos. 5, 6, 7, and 8 are similar in composition respectively to Nos. 1, 2, 3, and 4 except that the quantity per acre is increased by one-half. Plot No. 12 is the same as Plot No. 1, except that the quantity per acre is doubled.

Annual applications of fertilizer are given and a cover crop of vetch is sown early in July. The trees are 27 by 27 feet apart each way and about 15 years old.

The crop of fruit was light during 1913. There was a fair crop this season. The yields as tabulated are from the two most uniform trees in each plot.

HOW FERTILIZED.

1. Nitrate of Soda	4	per cent.	
Acid Phosphate	8	"	
Muriate of Potash	10	"	600 pounds per acre.
2. Nitrate of Soda	4	"	
Acid Phosphate	8	"	
Muriate of Potash	5	"	600 pounds per acre.
3. Nitrate of Soda	4	"	
Acid Phosphate	4	"	
Muriate of Potash	5	"	600 pounds per acre.
4. Nitrate of Soda	2	"	
Acid Phosphate	8	"	
Muriate of Potash	10	"	600 pounds per acre.
5. Nitrate of Soda	4	"	
Acid Phosphate	8	"	
Muriate of Potash	10	"	900 pounds per acre.
6. Nitrate of Soda	4	"	
Acid Phosphate	8	"	
Muriate of Potash	5	"	900 pounds per acre.
7. Nitrate of Soda	4	"	
Acid Phosphate	4	"	
Muriate of Potash	5	"	900 pounds per acre.
8. Nitrate of Soda	2	"	
Acid Phosphate	8	"	
Muriate of Potash	10	"	900 pounds per acre.
9. Manure			15 tons per acre.
10. Fish			500 pounds per acre.
11. Check			
12. Nitrate of Soda	4	per cent.	
Acid Phosphate	8	"	
Muriate of Potash	10	"	1,200 pounds per acre.

The dogfish fertilizer used in the above experiment analysed as follows:—Nitrogen 9·46 per cent; phosphoric acid, 3·16 per cent; potash, 0·93 per cent; oil, 26·69 per cent. The oil, of course, has no fertilizing value. The stable manure was fairly well rotted and apparently of average quality.

As would be expected, there is no great gain from the fertilizing in the spring of 1913, on the crop of that year. It will be noticed in 1914, however, that on the check plot the weight per 100 apples is considerably less and also where the 2-8-10 fertilizer was used there is quite a decrease in weight of 100 apples over the 4-8-10 plots. It will also be noted that the plots receiving the 600 pounds fertilizer yielded from the two trees on each plot 121 pounds less fruit than on similar plots where 900 pounds was used per acre. It would appear that nitrogen was quite a deficient element in soil of this orchard, but it is doubtful that fertilizing above 600 pounds per acre will give sufficient increased crop to pay for the additional fertilizer.

YIELD FROM TWO TREES 1913.

Plot.	No. 1.		No. 2.		No. 3.		Culls.		Total.		Average weight per 100 apples.
	Apples.	Weight.	Apples.	Weight.	Apples.	Weight.	Apples.	Weight.	Apples.	Weight.	
		lb.		lb.		lb.		lb.	646	lb.	lb.
1.	428	125	131	27	66	16	21	5	612	173	25·21
2.	332	88	149	30	100	20	31	6	364	144	23·53
3.	228	67	72	16	47	12	17	4	337	99	27·03
4.	190	57	60	12	64	16	23	5	127	90	26·7
5.	62	17	20	4	26	6	19	4	376	31	24·41
6.	216	56	72	16	57	13	31	8	227	93	24·73
7.	135	36	42	8	38	7	12	2	440	53	23·35
8.	219	60	52	11	142	30	27	5	259	106	24·09
9.	140	41	29	6	72	17	18	4	251	68	26·25
10.	104	31	57	13	72	16	18	4	333	64	25·50
11.	169	48	71	16	75	17	18	4	662	85	25·52
12.	486	143	53	11	99	24	24	7		185	27·95

YIELD FROM TWO TREES 1914.

Plot.	No. 1.		No. 2.		No. 3.		Culls.		Total.		Average weight per 100 apples.
	Apples.	Weight.	Apples.	Weight.	Apples.	Weight.	Apples.	Weight.	Apples.	Weight.	
		lb.		lb.		lb.		lb.		lb.	lb.
1.	1,191	350	157	31	67	12	23	4	1,438	397	27·61
2.	1,110	287	267	53	75	12	33	6	1,485	358	24·11
3.	861	236	166	33	55	9	15	2	1,097	280	25·52
4.	779	202	254	45	67	10	28	4	1,128	261	23·14
5.	591	166	96	17	25	5	7	1	719	189	26·29
6.	1,287	337	227	41	51	9	50	6	1,615	393	24·33
7.	1,273	320	277	49	83	15	34	5	1,667	389	23·34
8.	1,036	237	594	107	157	25	136	17	1,923	386	20·07
9.	1,103	309	168	31	65	11	25	4	1,361	355	26·08
10.	969	273	150	27	23	4	12	2	1,154	306	26·52
11.	872	216	719	80	115	17	37	4	1,743	317	18·19
12.	1,978	523	400	77	210	38	63	8	2,651	646	24·37

ORCHARD FERTILIZER EXPERIMENT AT BRIDGETOWN, N.S.

A uniform block of Roxbury Russet (Nonpareil) apple trees about 30 years old was selected for this test. The trees are set diagonally 27 feet apart. The area in each plot is one quarter acre. There are eleven plots, with eight uniform Nonpareil trees in each, and each fertilized differently. The object of the test is to determine the relative value of basic slag as compared with acid phosphate for orchard work, and also to determine whether an application of lime is of any value for increasing the fruit yield. The lime used in this case, was the burnt rock lime which was put into small piles in the orchards, covered with soil and spread after it was slaked. The fertilizers were applied in 1913 and 1914.

The set of fruit on this block has been poor and not at all uniform. This is due apparently to improper pollination. The Nonpareil is apparently largely sterile to its own pollen and requires pollen from other varieties to give a satisfactory set of fruit. The Ben Davis and Baldwin are late bloomers like the Nonpareil and should remedy this fault if planted alternately with the Nonpareil.

Nonpareil trees with Baldwin and Ben Davis in close proximity gave an average yield of four barrels fruit per tree, while trees in the same orchard and not close to another variety gave only two barrels, and the fruit somewhat inferior. Block 8 and 11 have each Ben Davis and Baldwin trees and the increased yield is no doubt due to this. Block 6, 7, 9, and 10 are practically entirely Nonpareil.

On the other hand, a block made up of Nonpareils in another part of the orchard with no other varieties adjoining and the trees planted on the square 30 by 40 feet apart, with a good circulation of air, gave an average yield of 6 barrels per tree.

The limiting factor in this orchard is evidently self sterility, due in part to the trees being of one variety and also in a measure to the trees being too closely planted, thus not permitting of a free circulation of air and sunlight conditions suitable for bees to work during the blossoming time. Should a more even crop not be produced next season it will be advisable to abandon the experiment. The results so far show very little of value. The quality of the fruit was such that no reliable deductions can be made as to the value of the different fertilizers for orchard work.

The plots were sprayed uniformly with commercial lime-sulphur and arsenate of lead. The ground was kept well cultivated. The fertilizers were applied about the

middle of May. A cover crop of vetch was sown in the whole orchard the first week in July. The follo\. .g table gives the experiment in more detail and the yield per acre during the past two years:—

FERTILIZER EXPERIMENTS AT BRIDGETOWN.

Plot.	How Fertilized.	Quantity. per acre.	Average yield per tree 1913.	Average yield per tree 1914.
		Lb.	Lb.	Lb.
No. 1	Nitrate of Soda	160		
	Acid Phosphate	320		
	Muriate of Potash	120		
	Lime	1,200	80·03	280·0
No. 2	Nitrate of Soda	160		
	Slag	320		
	Muriate of Potash	120		
	Lime	1,200	43·62	262·5
No. 3	Nitrate of Soda	160		
	Acid Phosphate	320		
	Muriate of Potash	120	56·88	295·5
No. 4	Nitrate of Soda	160	61·12	227·5
No. 5	Nitrate of Soda	160		
	Slag	320		
	Muriate of Potash	120	200·6	336·0
No. 6	No. Fertilizers		74·6	126·0
No. 7	Nitrate of Soda	160		
	Slag	320	140·0	157·4
No. 8	Slag	320	268·33	420·0
No. 9	Nitrate of Soda	160		
	Muriate of Potash	120	89·09	165·4
No. 10	Muriate of Potash	120		
	Acid Phosphate	320	20·44	124·4
No. 11	Nitrate of Soda	160		
	Acid Phosphate	320	28·4	421·0

KENTVILLE.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

WEATHER CONDITIONS OF 1914.

The winter was colder than the average, with spells of intense cold almost unprecedented. The average mean temperature for January, February, and March was 15·5 degrees against an average for the last forty years for these months of 18 degrees. There was, however, beginning on the 24th December, a nice even blanket of snow, and frost did not penetrate as deeply as in more open winters. The snowfall was not above the average one on the whole, and covered the ground till April 10. April was a cold and backward month with a below zero record of −3·5 degrees on the 5th, cold high winds and with a precipitation of 4·54 inches, nearly twice the average for the month. May continued cold and windy with a minimum record on the 1st of 24 degrees, and frost on the 2nd, 5th, 7th, 8th, 12th, 13th and 29th; there were some warm days, the thermometer reaching 89 degrees on the 26th. There was only one-third of the normal precipitation that month and conditions were most favourable for cultivation. Vegetation was very backward, and cold backward weather continued through June and up till the 22nd July when 44 degrees were recorded. All crops consequently made slow growth till almost August 1, and at that date such crops as corn and tomatoes were particularly unpromising. The precipitation, though not quite up to the average, was ample for the Station land and for most soils in the province, and when continued warm weather came in August and September growth was most satisfactory and crops eventually were very good. The average mean temperature for August, September and October was three degrees higher than the average temperature for the last 40 years. Harvest weather was ideal, hay and grain being housed in splendid condition, and fine weather continued into November, so that root crops as well as others were taken from the fields in the best possible condition.

The area devoted to horticulture is 17 acres, comprising the old orchard 2 acres, new orchard 11 acres, small fruits, vegetables, and flowers 4 acres.

The trees in the old orchard show considerable improvement as a result of the care and attention given.

Nine trees of Scott Winter were top-grafted in the spring of 1913; on seven of the trees every graft took; on the remaining two 68 per cent took. The scions have made fairly vigorous growth during the season.

A new orchard of eleven acres was set out under the direction of Mr. M. B. Davis, and 802 trees were planted, comprising 606 apples, 27 pears, 100 plums and 69 cherries. A few trees have died. In alternate rows of one block the holes for the trees were loosened with dynamite to determine what advantages, if any, may accrue from this method.

All trees were sprayed with a contact spray for aphides.

The names of varieties planted and number of trees of each are as follows:—

VARIETIES OF APPLES PLANTED IN COMMERCIAL ORCHARD.

	Number of Trees Planted.		Number of Trees Planted.
Alexander	15	Milwaukee	30
American Golden Russet	15	McIntosh Red	60
Bethel	15	New Brunswick	12
Canada Baldwin	5	North Western Greening	5
Crimson Beauty	31	Salome	5
Dudley	45	Wealthy	77
Duchess	30	Wolf River	15
Fameuse	60	Yellow Bellflower	15

VARIETIES OF APPLES PLANTED IN VARIETY ORCHARD.

Anson	2	Niobe	1
Anwyck	2	Northern Spy Seedling	6
Black Ben Davis	2	Neville	2
Bruno	2	Ottawa	2
Baxter	2	Oswald	2
Ben Davis	2	Orange Crab	2
Cromer	2	Pinto	1
Charlamoff	2	Pomme Royale	2
Cora	2	Petrel	2
Cobalt	2	Pensaukee Russett	2
Danville	2	Pike Seedling	2
Forest	2	Percival	2
Fisher Pippin	4	Peabody Greening	2
Galetta	2	Peach	2
General Grant (Crab apple)	2	Point Apple	2
Granby	2	Rufus	1
Gilda	2	Rocket	1
Herald	2	Rosalie	2
Homer	2	Radnor	2
Hyslop (Crab apple)	2	Ripon	2
Inkerman Greening	2	Seedling from W. Moore	1
Kinkead	2	Schoener Van Nordhausen	1
Kelso	2	Scarlet Pippin	2
Kildare	2	Seton	2
Langford Beauty Seedling	2	Severn	2
La Victoire	2	Sorel	4
Lowland Raspberry	2	Shiawassee Beauty	2
Lubsk Queen	2	Sonora	3
Linton	2	Sharp Perfection	2
Lawver Seedling	2	Summer Harvey	4
Lonsfield	2	Sweet Crab	2
Loka	2	Sweet Greening	2
Melvin	1	Stark	2
Mendel	2	Stanley	2
Medford	2	Trenton	2
Melba	2	Transcendent (Crab apple)	2
Munro Sweet	4	Winter St. Lawrence Seedling	2
Mark 5	3	Walworth Pippin	2
Mark 13	2	Windsor Chief	2
Martha (Crab apple)	2	Whitney Crab	2
Montreal Beauty	2	Walden	2
McMahon White	2		
		Total	606

PEARS.

Anjou	5	Flemish Beauty	5
Bartlett	5	Lawrence	5
Clapp Favourite	5		
		Total	25

FREDERICTON.

PLUMS.

	Number of Trees Planted.		Number of Trees Planted.
Bradshaw	5	Moore Arctic	20
Burbank	5	Red June	5
Chabot	2	Shiro	2
Climax	2	Shropshire Damson	5
Gueii	5	Shipper Pride	5
Glass Seedling	2	Stanton	2
Imperial Gage	20	Voronesh	1
John A	2	Washington	5
Lombard	5	Yellow Egg	5
Latchford	2		
		Total	100

CHERRIES.

Dyehouse	5	Montmorency	5
English Morello	5	Minnesota d'Osthein	2
Early Richmond	7	Montmorency Ordinaire	2
Empress Eugenie	2	Montmorency Large	2
Fouche Morello	2	Orel 24	7
Griotte d'Osthein	2	Orel 25	5
Griotte Morello	2	Osthein M	5
Hertzformige Weischel	2	Suisse Fruche Weischel	2
Homer	2	Vladimir M	2
Koslov Morello	2	Vladimir	2
Lieb	2	Wragg	2
		Total	69

SMALL FRUITS.

A plantation of small fruits was started by planting 14 varieties of Black Currants, 14 varieties of Red Currants, 3 varieties of White Currants, 4 varieties of Gooseberries and 11 varieties of Raspberries.

Golden Queen Raspberry was the only one that fruited. All varieties made good growth during summer. Following is a list of varieties planted:—

BLACK CURRANTS.

Black Champion.
Boskoop Giant.
Buddenborg.
Climax.
Clipper.
Collin Prolific.
Eagle.
Eclipse.
Kerry.
Lee Prolific.
Magnus.
Saunders.
Topsy.
Victoria.

RED CURRANTS.

Admirable.
Chautauqua.
Cherry.
Cumberland.
Diploma.
Fay Prolific.
Greenfield.
Perfection.
Rankins Red
Red Cross.
Red Dutch.
Red Grape.
Victoria Red.
Wilder.

WHITE CURRANTS.

Large White.
White Cherry.
White Grape.

GOOSEBERRIES.

Crown Bob.
Downing.
Pearl.
Whinham Industry.

FREDERICTON.

RASPBERRIES.

Brighton.
Columbian.
Count.
Golden Queen.
Herbert.
King
Marlboro.
Older.
Ruby.
Sarah.
Shaffers.

STRAWBERRIES.

Thirty-two varieties of strawberries were planted, the plants being set out in double rows and regularly cultivated. Very few survived owing to the dried out condition in which they were received from the growers, with the exception of the nine varieties of seedlings originated at the Central Farm; these came along in fairly good shape. Following is a list of the varieties planted:—

Abington.
Bederwood.
Bisel.
Brandywine.
Bubach.
Chesapeake.
Clyde.
Enhance.
Excelsior.
Gandy.
Glen Mary.
Haverland.
Howard.
Lovett.
Mead.
Parson Beauty.
Pocomoke.
Sample.
Senator Dunlap.
Stevens Late Champion.
Tennessee.
Warfield.
Wm. Belt.
Cassandra, C.E.F. seedling.
Cordelia " "
Desdemona " "
Julia " "
Mariana " "
Ophelia " "
Portia " "
Valeria " "
Virgiia " "

GRAPES.

Twenty-five varieties of grapes were set out in the nursery and will be planted in their permanent quarters next spring. Following is a list of varieties:—

Brant.
Brighton.
Campbell Early.
Canada.
Delaware.
Early Daisy.
Eldorado.
Eumelan.
Hartford.
Lindley.
Manito.
Mary.
McTavish.
Merrimac.
Moore Diamond.
Moore Early.
Moyer.
Pattison.
Peabody.
Potter.
Rogers 36.
Vergennes.
Wilder.
Wilkins.
Winchell.

RHUBARB.

Four varieties of rhubarb were planted, viz.:—

Hobday Giant.
Early Raspberry.
Monarque.
Prima Donna.

The plants grew vigorously and should make large clumps next year.

TREES AND SHRUBS.

The nursery stock planted in the spring of 1913 consisting of ornamental trees, conifers and shrubs did well with the exception of some of the conifers which arrived in a very dry state and subsequently died.

About 6,000 young trees, etc., were added to the nursery, and these made satisfactory growth during the summer.

FREDERICTON.

ROSES.

Fifty-three varieties of roses were grown and all did well. The following varieties were exceptionally fine, viz.:—

Dean Hole, Hybrid Tea. Colour light carmine shaded salmon; fragrant.

Etoile de France, Hybrid Tea. Velvety crimson; fine form.

Madame Abel Chatenay, Hybrid Tea. Carmine shaded salmon; fine form; free bloomer; reliable.

Madame Ravary, Hybrid Tea. Rich deep golden yellow; very beautiful in the bud.

Charles Lefebvre, Hybrid Perpetual, rich velvety crimson; fine form; fragrant.

Frau Karl Druschki, Hybrid Perpetual. Pure white; vigorous grower; best white H. P.

General Jacqueminot, Hybrid Perpetual. Crimson scarlet; fragrant; one of the most reliable.

BULBS.

About 5,000 bulbs planted in the fall gave a welcome display of colour in the spring. The first to unfold their blossoms were Crocuses, *Scilla sibirica* and *Chionodoxa.* These were followed by early tulips, daffodils, late-flowering tulips, *Iris hispanica* and *Iris anglica.* It would be invidious to select any particular variety from the various groups as being the best, all being so good.

CANNAS.

A collection of cannas received from the Experimental Farm, made a fine display. Following is a list of varieties:—

Cinnabar.
Comte de Sache.
Hugues Lapaire.
King Humbert.
Mrs. Kate Gray.
Pennsylvania.
Queen Charlotte.
Richard Wallace.
Uncle Sam.

DAHLIAS.

The dahlias were not received in time to give good results and failed to bloom.

GLADIOLI.

A collection of some of the best varieties was planted and produced fine spikes of bloom. Following is a list of varieties:—

America.
Glory of Holland.
Halley.
Hollandia.
Joseph Hulot.
Niagara.
Lily Lehman.
Princeps.
Pink Beauty.
Willy Wigman.

ANNUALS.

Forty-nine varieties of annuals were sown in drills in hotbeds or in the open ground according to the requirements of the variety. The seedlings were pricked out when large enough to handle, and finally transplanted to their flowering quarters.

Eight flower beds measuring 66 feet by 6 feet were prepared and a heavy dressing of old manure thoroughly incorporated.

The plants grew exceptionally well and produced a wonderful profusion of bloom, their varied colours and graceful forms delighting the many visitors, whose expressions of admiration were very gratifying to hear.

FREDERICTON.

It is a pity that these easily raised plants are not more generally grown. Following is a record of the period of bloom:—

ANNUALS SOWN IN HOTBED.

Kinds.	Sown in hotbed.	Transplanted in garden.	In Bloom.	
			From.	To
Asters (12 varieties)	April 25	June 9	Aug. 12	Oct. 7.
Alonsoa	" 15	" 3	July 7	" 7.
Antirrhinum (18 varieties)	" 15	May 30	" 8	" 7.
Balsam	" 15	June 3	" 6	Sept. 29.
Bartonia aurea	" 15	" 3	" 6	Oct. 7.
Carnation (Marguerite)	" 15	May 30	" 15	" 10.
Celosia cristata	" 15	June 3	" 8	" 7.
Coreopsis	" 15	" 3	" 7	" 7.
Cosmea	" 17	May 30	June 25	" 7.
Daisy	" 15	June 5	July 1	" 7.
Dianthus chinensis	" 17	" 5	Aug. 10	" 7.
Dianthus Heddewigii	" 17	" 5	" 3	" 7.
Dimorphotheca aurantiaca hybrids	" 17	" 5	July 18	Sept. 29.
Kochia	" 15	" 5		" 29.
Lobelia	" 15	" 9	July 21	" 29.
Marigold, French	" 15	" 5	" 8	" 29.
Nemesia strumosa	" 17	" 9	June 25	Oct. 10.
Nicotiana hybrids	" 15	" 9	July 3	Sept. 29.
Pansy (6 varieties)	" 17	" 7	" 3	Oct. 14.
Petunia (4 varieties)	" 27	" 7	June 27	" 7.
Phlox Drummondii (6 varieties)	" 17	" 7	July 8	" 14.
Portulaca	" 15	" 5	" 11	Sept. 29.
Ricinus (Bronze King)	" 17	" 7	Aug. 3	" 29.
Salpiglossis	" 25	" 9	July 17	" 29.
Salvia (Fireball)	" 17	" 7	" 13	" 29.
Scabious	" 15	" 9	" 9	" 29.
Schizanthus	" 17	" 7	" 17	" 29.
Stocks (ten week) 6 varieties	" 15	" 7	" 11	" 29.
Verbena	" 25	" 9	" 7	Oct. 7.
Zinnia	" 25	" 9	" 10	Sept. 29.

ANNUALS SOWN IN OPEN GROUND.

Sown.		In Bloom.	
		From.	To
Alyssum	May 15	June 22	Oct. 7.
Brachycome	" 15	Aug. 30	" 7.
Centranthus	" 15	July 27	" 7.
Chrysanthemum	" 15	" 18	" 7.
Clarkia elegans	" 15	Aug. 13	" 7.
Eschscholtzia	" 15	July 7	Sept. 29.
Godetia (6 varieties)	" 15	" 13	" 29.
Larkspur (3 varieties)	" 15	" 29	Oct. 7.
Lavatera	" 15	" 18	" 7.
Leptosiphon hybrids	" 15	" 23	" 7.
Linum grandiflorum rubrum	" 15	" 17	" 7.
Lupinus	" 15	July 23	" 7.
Nasturtium	" 15	Aug. 20	Sept. 29.
Poppy, Paeony flowered	" 15	" 26	" 29.
Poppy, Shirley	" 15	" 27	" 29.
Sweet Sultan	" 15	" 3	Oct. 7.
Viscaria cardinalis	" 15		Sept. 29.

FREDERICTON.

FLOWERS.

EVERLASTINGS.

Six varieties of everlastings were sown in flats in hotbed April 20 and transplanted to open ground June 5.

—	In Bloom.	
	From.	To.
Acroclinium, colours white and pink	July 21	Sept. 29.
Ammobium alatum, small white flowers	" 23	" 29.
Helichrysum, golden yellow, pink, light purple and scarlet	" 23	" 29.
Rhodanthe maculata, white	" 27	" 17.
Statice latifolia, seed did not germinate		
Xeranthemum, double flowers, white and purple	" 21	" 29.

If gathered at the right stage and properly dried by hanging them up in small bunches in a warm airy room, these flowers will last for a long period. Acroclinium, Helichrysum and Rhodanthe are the most desirable for this purpose.

SWEET PEAS.

Fifty-four varieties of sweet peas were sown in flats on 13th April in hotbed and transplanted on 15th May into two beds, each 300 feet long by 2½ feet wide.

The plants were set out 9 inches apart in the rows; they made vigorous growth, attaining a height of over 8 feet; the blooms—mostly four on a stem—were of high quality throughout. The following varieties are especially worthy of note, viz.:—

Asta Ohn, immense blooms of beautiful lavender and mauve.
Maud Holmes, deep crimson.
Florence Nightingale, rich lavender, very large blooms.
Mrs. Routzahn Spencer, cream, tinted pink shading to apricot.
Stirling Stent, deep salmon orange, a beautiful flower.
Thomas Stevenson, brilliant orange scarlet.

Stirling Stent and Thomas Stevenson are somewhat liable to burn in full sunlight, and should be grown in partial shade for best results.

PERENNIALS.

A perennial border 600 feet long by 10 feet wide was prepared by ploughing in a heavy dressing of well rotted manure, afterwards being worked up into good condition of discing. Several hundred perennials consisting of *Anchusa italica,* Aquilegia 4 varieties, Campanula 9 varieties, *Coreopsis grandiflora*, Delphiniums, 8 varieties Dianthus, Gaillardias, 2 varieties, *Gypsophila paniculata,* Heleniums, 2 varieties, *Hesperis matronalis,* Hibiscus, Hollyhock, Lupinus, Platycodon, Polemonium, and Pansies. Cannas, Dahlias, and Gladioli were set out at intervals along the border. Liquid manure was applied after rain whenever the opportunity occurred.

FREDERICTON.

IRIS.

Twenty varieties of Iris were grown and gave a fine display of flowers of various shades. Following is a list of varieties:—

Iris florentina.
" *germanica* Kharput.
" *hybrida* Duc de Nemours.
" " Mrs. H. Darwin.
" " Verschnur.
" *neglecta* Agathe.
" " Sappho.
" *orientalis gigantea.*
" *plicata* Gazelle.
" " Lord Seymour.
Iris plicata Mad. Chereau.
" *sambucina* Solomon.
" *squalens* Jacquiniana.
" " Reine des Belges.
" *variegata* Coquette.
" " Darius.
" " Gracchus.
" " Honourable.
" " Innocenza.
" " Ossian.

PAEONIES.

Thirty-five varieties of paeonies were planted last fall and gave a nice lot of blossoms in the spring and early summer, the rich copper foliage adding greatly to their beauty. Following is a list of varieties:—

Pæony Modele de Perfection.
" Raphael.
" Marguerite Gerard.
" Marie Crousse.
" *Festiva Maxima.*
" Asa Gray.
" Thérèse.
" Mlle. Leonie Calot.
" Marie Lemoine.
" Monsieur Martin Cahuzac.
" Mons. Jules Elie.
" Albert Crousse.
" Madame d'Hour.
" *Grandiflora Nivea Plena.*
" Madame de Galhau.
" Livingstone.
" La Tulipe.
" Duchesse de Nemours (Calot).
Pæony Charlemagne.
" Feliz Crousse.
" La Rosière.
" Avalanche.
" Couronne d'Or.
" Mme. de Verneville.
" Mlle. Rousseau.
" Octave Demay.
" Philomele.
" Marie Stewart.
" Mad. Emilie Galle.
" Mme. Boulanger.
" Marquis de Ivry.
" Mme. Auguste Dessert.
" Madame Geisseler.
" Madame Bucquet.
" Volcan.

VEGETABLES.

The land for vegetables was divided into plots 66 feet wide. The land had been manured in 1913 as follows: 20 tons barnyard manure and 700 pounds fertilizer containing 2·75 Nitrogen, 10·6 Phosphoric Acid and 8·3 Potash per acre. In the spring of 1914 it was divided into plots 66 feet wide. All rows were three feet apart except onions. The following tables show the results obtained, viz.:—

BEANS.

Nine varieties of beans were sown on land which received manure at the rate of 30 tons per acre. They produced good crops of fine quality. There was practically no anthracnose.

Variety.	Length of row.	Yield.
	Feet.	Pecks.
Valentine Wax	66	$5\frac{3}{4}$
Wardwell Kidney Wax	66	$5\frac{1}{2}$
Extra Early Valentine	66	5
Extra Early Refugee	66	$5\frac{1}{2}$
New White Seeded Stringless	66	$4\frac{1}{2}$
Keeney Rustless Golden Wax	66	$3\frac{1}{2}$

FREDERICTON.

BEETS.

Six varieties of beets were sown in drills on the 2nd of June on land which received manure at the rate of 30 tons per acre. Of these, Ruby Dulcet and New Meteor were by far the best.

Following is a list of the varieties grown:

Variety.	Length. of row. Feet.	Yield of Green Beans. Lb.
Ruby Dulcet	66	62·5
New Meteor	66	60·7
Early Blood Red	66	55·0
Egyptian Dark Red Flat	66	47·3
Black Red Ball	66	45·0
Eclipse	66	41·4

BRUSSELS SPROUTS.

Seed of one variety—Dwarf Improved—was sown in flats in hotbed on 7th April, pricked out once, and transplanted to open ground on 29th May. A fine crop of sprouts was secured.

CABBAGE.

Sixteen varieties were sown in flats in hotbed on 7th April, pricked out once, and transplanted on 29th May, each variety produced good heads of fine quality. Early Jersey Wakefield and Paris Market were the earliest, being ready for use 27th of July.

Cabbage butterflies were troublesome, but the use of hellebore kept them in check. Following is a list of varieties grown:—

German Nofalt.
Lubeck.
Winnigstadt.
Fottler Improved Drumhead.
Extra Early Midsummer Savoy.
Paris Market Very Early.
Danish Summer Ballhead.
Extra Amager Danish Roundhead.
Erfurt Small.
Magdeburg.
Early Jersey Wakefield.
Large Late Flat Drumhead.
Fottler Improved Brunswick.
Copenhagen Market.
Flat Swedish.
Improved Amager Danish Roundhead.

CARROTS.

Three varieties of carrots were sown in drills, on land which received manure at the rate of 30 tons per acre, and thinned out as soon as large enough to handle. Improved Nantes was the best for shape and flavour, besides giving the greatest yield. Following are the results obtained:—

Variety.	Length of row. Feet.	Yield. Lb.
Improved Nantes	66	118·5
Chantenay	66	105·8
French Horn	66	102·9

CAULIFLOWERS.

Three varieties of cauliflowers were sown in flats in hotbed on April 7, pricked out once and transplanted to open ground 30th May. Each variety gave excellent results.

CELERY.

Seven varieties of celery were sown in flats in hotbed on April 7th, pricked out twice and transplanted to trenches on 26th June, in soil which received manure at the

rate of 30 tons per acre. All varieties did well and gave good results, particularly Improved White Plume. Following are the results obtained:—

Variety.	No. of Heads. Dozen.	Yield. Lbs.
Improved White Plume..	1	20·4
Giant Pascal..	1	20·0
Evans Triumph..	1	16·0
White Plume..	1	14·6
Noll Magnificent..	1	12·2
French Success..	1	10·6
Paris Golden Yellow..	1	11·4

CITRON.

Five hills of citron were planted in hotbed, but failed to produce large fruit in any quantity, only one fruit weighing 10 pounds; the rest averaging 5 pounds to 6 pounds each.

CORN.

Fourteen varieties of table corn were planted on 10th June, but owing to the cold and backward season made very slow growth until the end of July.

Early Dawn, Early Iowa and Early Fordhook came into use before any of the others. Following is a list of the varieties grown:—

Black Mexican.
Country Gentleman.
Early Dawn.
Early Evergreen.
Early Fordhook.
Early Iowa.
Early Malcolm.
Extra Early Adams.
Golden Bantam.
Malakoff.
Metropolitan.
Perkins Extra Early Market.
Pocahontas.
Stowell Evergreen.

CUCUMBERS.

Five varieties of cucumbers were sown in strawberry boxes on 30th April and planted out on 12th June. Peerless or Improved White Spine stands out as the earliest and most prolific, Giant Pera coming second; Cool and Crisp while not giving a large yield is of excellent flavour.

EGG PLANT.

Weather conditions were unfavourable to the successful growing of egg plants, and they failed to produce any crop.

LETTUCE.

Eleven varieties of lettuce were sown in flats in hotbed on 15th April, pricked out once, and transplanted. All varieties grew well, Grand Rapids and Dreer All Heart being the best.

MUSKMELON.

Four varieties of muskmelon were grown, the only variety producing fruit of any size being Hackensack, and these were badly damaged by rats. Following is a list of varieties:—

Emerald Gem,
Hackensack,
Paul Rose.
Salzer Earliest Ripe.

FREDERICTON.

ONIONS.

Seven varieties of onions were sown in drills on the 26th May, in soil which received manure at the rate of 30 tons per acre. They did not grow much until August, with the result that the bulbs did not get sufficient growth to ripen properly. Danvers Yellow Globe, Baker White Globe, and Baker Yellow Globe gave the best results in the order named. Following are the results obtained:—

Variety.	Length of row. Feet.	Yield. Lb.
Danvers Yellow Globe	66	20·1
Baker White Globe	66	20·4
Baker Yellow Globe	66	20·5
Baker Red Globe	66	18·9
Large Red Wethersfield	66	17·7
Salzer Giant Red Wethersfield	66	15·8
Johnson Dark Red Beauty	66	7·9

PARSNIPS.

Two varieties of parsnips were sown, Improved Hollow Crown and Intermediate, the latter variety being in every way superior to the first named.

PEAS.

Fourteen varieties of peas were sown, on land which received manure at the rate of 30 tons per acre. A good stand of each variety was obtained with the exception of the Lincoln, which germinated badly and gave no crop at all.

The most desirable varieties are as follows, with yields in the order named, viz.: Heroine, Telephone, Gradus, Juno, Early Giant and Quite Content.

Following are the results obtained:—

Variety.	Length of row. Feet.	Yield of Green Peas in Pod. Pecks.
Heroine	33	5½
Telephone	33	5
Gradus	33	2¾
Juno	33	3
Early Giant	33	2¾
Quite Content	33	3
Dainty Duchess	33	3
Thomas Laxton	33	2¾
McLean Advancer	33	2¼
Premium Gem	33	1¾
Stratagem	33	1¼
Gregory Surprise	33	2
American Wonder	33	1¼
Sutton Excelsior	33	1½

The above test is not conclusive owing to the ravages of blackbirds.

PEPPERS.

Four varieties of peppers were sown in paper pots in hotbed, repotted once and then transplanted to open ground on the 12th June. All varieties were satisfactory, with a preference for Long Red Cayenne.

POTATOES.

In all, ten and three-tenths acres were planted in potatoes. Most of the soils were sandy loam. An area of four and one-third acres at the foot of a hill was very wet until last season, when it was tile drained. It was planted in potatoes this season

and staked out into 53 plots of one-twentieth of an acre each. Roads sixteen feet wide were run between each range of plots and paths four feet wide between each plot. To test the relative natural fertility of each plot the whole area was planted to potatoes and a record kept of the product of each plot. As will be seen by the following tabulated statement, this unfertilized area produced a fair crop and the sample was excellent.

All portions of the crop were handled similarly. Excepting the 66 hill variety area everything was planted with a single row planter. A few Irish Cobblers were planted for table use on the 12th May. The rest of the crop was planted from the 12th to the 25th June. It was kept thoroughly cultivated before and after appearing above ground and in some places where couch grass was bad hand hoeing was resorted to. Mustard was hand pulled all through the season as it appeared in the rows.

Very few Colorado beetles appeared. The first spraying was done on the 5th and 6th August. 4-5-40 Bordeaux mixture was used with which was mixed 2 pounds of Arsenoid. Spraying was again done on the 17th August, and a third spraying on the 4th and 5th September. No insecticide was used in this spraying and a fourth and final application was given on the 14th and 15th September.

There were several stalk diseases in evidence, including Rhizoctonia, Black Leg, Stem Rot, Early Blight and Mosaic. Spraying did not keep off Early Blight as well as might have been expected, but the September application checked its spread. There also seemed to be a shiny, almost silvery affection of the leaves that has not as yet been identified. There was no Late Blight on the Station crop, though there was some elsewhere in Central New Brunswick.

So far as possible all the plants affected with the diseases mentioned above were dug out and the tubers removed before the stalks were frosted.

The first touch of frost was noticed on the 28th September. Only a few leaves were injured. Frost on the 1st October wilted down most of the stalks and what withstood that frost were killed on the 8th October, at which date harvesting began.

A Canadian-made digger was tried out and did very satisfactory work in nearly every way; quite equal to the United States machines, and of much lighter draught.

The crop was not completely harvested until the 26th October. About half of it was sold from the field, netting approximately 30c per bushel. Small lots were sold at 40c per bushel.

The unmarketable potatoes were fed to pigs, poultry and cattle, and seed and winter supplies were stored in the various cellars on the farm.

In the seed plots each hill was dug separately, the best hills marked with a small stake and picked up separately from the smaller hills. The following is the relative yield per hill of the selected and unselected hills of the varieties named:—

Variety.	No. of large hills.	Yield.	Yield lb. per hill.	No. of small hills.	Yield.	Yield lb. per hill.	Yield per acre.
		lb.			lb.		bush.
Vick Extra Early, C	153	655	4·21	73	274	3·75	932·4
Houlton Rose, O	68	219	3·22	271	760	2·80	610·6
Late Puritan, N	43	124	2·88	173	336	1·94	579·1
Everett, N	47	228	4·85	207	274	1·32	527·4
Morgan Pink Seedling, O	23	103	4·47	186	418	2·83	512
Green Mountain, O	14	67	4·78	189	365	1·92	497·8
Wee McGregor, C	65	359	5·52	346	353	1·02	448·2
Irish Cobbler, O	11	34	3·69	106	166	1·56	411
Eureka Extra Early, O	56	289	5·16	298	265	0·88	404·9

VARIETY TESTS.

One hundred and fifty-two varieties were grown in rows of 66 hills each, and the following are those which yielded at the rate of over 400 bushels per acre in 1914, and their yields in 1913 are added for comparison.

Variety.	1914 Bush. per acre.	1913 Bush. per acre.
Early Hebron, O	510·4	334
Irish Cobbler, I. H	488·4	413
Money Maker, I. H	488·4	242
Langworthy, O	484·0	233
Dreer Standard, C	475·2	440
Empire State, I. H	475·2	402
Everett, N	475·2	422
Dreer Standard, I. H	466·4	422
Empire State, O	444·4	220
Wee McGregor, N	440·0	422
Late Puritan Br., O	435·6	367
Everett, C	431·2	409
Moore Green Mountain	431·2	380
Gold Coin, N	426·8	270
Houlton Rose, O	426·8	512
Reeves Rose, I. H	426·8	220
Rochester Rose, N	426·8	352
Rawlings Kidney, N	422·4	349
Prince Albiert, O	418·0	308
Early Trumph	418·0	
Rural New Yorker, C	411·6	277
Eureka Extra Early, O	409·2	462
Rawlings Kidney, C	404·8	396
Dreer Standard, O	404·8	393
Manistee, O	404·8	387
Morgan Seedling, I. H	400·4	444
Reeves Rose, N	400·4	314
Table Talk, N	400·4	545

FREDERICTON.

VARIETIES of Potatoes Grown in Rows of 66 Hills each.

Name of Variety.	Source of Seed.	Yield per Acre.			
		Marketable Potatoes, 1914.	Small Potatoes, 1914.	Total Yield, 1914.	Total Yield, 1913.
		Bush.	Bush.	Bush.	Bush.
Abundance	C. E. F. Ottawa	206·8	52·8	259·6	274
Acquisition	"	268·4	74·8	343·2	457
American Wonder	Nappan	48·4	52·8	101·2	305
American Wonder	Indian Head	281·6	30·8	312·4	297
American Wonder	Charlottetown	369·6	30·8	400·4	310
American Wonder	C. E. F. Ottawa	250·8	57·2	308·0	152
Bermuda Early	"	132·0	39·6	171·6	68
Bovee	"	189·2	52·8	242·0	400
Brydon Beauty	"	228·8	79·2	308·0	319
Brydon	"	180·4	52·8	233·2	378
Buckeye State	"	66·0	17·6	83·6	35
Burpee Extra Early	"	193·6	52·8	246·4	272
Burbank Seedling	Charlottetown	369·6	52·8	422·4	199
Carman No. 1	"	264·0	26·4	290·4	290
Carman No. 1	Indian Head	338·8	48·4	387·2	325
Carman No. 3	Ottawa	316·8	26·4	343·2	462
Clark No. 1	"	145·2	22·0	167·2	316
Clyde	"	343·2	35·2	378·4	479
Conquering Hero	"	277·2	39·6	316·8	418
Dalmeny Beauty	"	193·6	35·2	228·8	356
Dalmeny Beauty	Indian Head	303·6	52·8	356·4	462
Dalmeny Hero	Ottawa	286·0	48·4	334·4	435
Dalmeny Regent	"	255·2	44·0	299·2	300
Dalhousie Seedling	"	272·8	44·0	316·8	365
Dreer Standard	Nappan	321·2	17·6	338·8	312
Dreer Standard	Ottawa	360·8	44·0	404·8	393
Dreer Standard	Charlottetown	422·4	52·8	475·2	440
Dreer Standard	Indian Head	365·2	101·2	466·4	442
Early White Prize	Nappan	352·0	35·2	387·2	418
Early Market	C. E. F. Ottawa	167·2	26·4	193·6	206
Early White Albino	"	264·0	48·4	312·4	356
Early Norther	"	237·6	17·6	255·2	235
Early Hebron	"	457·6	52·8	510·4	334
Early Rose	"	110·0	17·6	127·6	299
Early Nebraska	"	321·2	13·2	334·4	415
Early Ohio	"	228·8	30·8	259·6	338
Early May	"	136·4	26·4	162·8	277
Early Six weeks	"	180·4	57·2	237·6	347
Early Norther	Indian Head	343·2	39·6	382·8	323
Eldorado	C. E. F. Ottawa	272·8	83·6	356·4	338
Empire State	Charlottetown	347·6	26·4	374·0	310
Empire State	Indian Head	440·0	35·2	475·2	402
Empire State	C. E. F. Ottawa	400·4	44·0	444·4	220
Empire State	Nappan	140·8	17·6	158·4	332
Emigrant	C. E. F. Ottawa	70·4	44·0	114·4	114
Eureka Extra Early	"	312·4	96·8	409·2	462
Everett	Nappan	378·4	96·8	475·2	422
Everett	Indian Head	176·0	39·6	215·6	204
Everett	Charlottetown	96·8	334·4	431·2	409
Factor	Nappan	154·0	61·6	215·6	220
Factor	Ottawa	198·0	...	198·0	385
Factor	Indian Head	321·2	44·0	365·2	224
Fannie Dean	C. E. F. Ottawa	228·8	39·6	268·4	343
Gold Coin	Nappan	382·8	44·0	426·8	270
Gold Coin	C. E. F. Ottawa	215·6	44·0	259·6	365
Gold Coin	Charlottetown	193·6	30·8	224·4	448
Gold Finder	C. E. F. Ottawa	132·0	74·8	206·8	158
Green Mountain	"	184·8	30·8	215·6	420
Green Mountain, Jr.	"	215·6	66·0	281·6	308
Green Mountain	Charlottetown	228·8	44·0	272·8	446
Hard to Beat	C. E. F. Ottawa	154·0	30·8	184·8	213
Hard to Beat	Indian Head	136·4	70·4	206·8	171

FREDERICTON.

VARIETIES of Potatoes Grown in Rows of 66 Hills Each.—*Continued.*

Name of Variety	Source of Seed.	Marketable Potatoes, 1914.	Small Potatoes, 1914.	Total Yield, 1914.	Total Yield, 1913.
		bush.	bush.	bush.	bush.
Hard to Beat	Nappan	110·0	30·8	140·8	180
Harris Snowball	C. E. F., Ottawa	57·2	30·8	88·0	162
Hebron	Indian Head	154·0	17·6	171·6	213
Houlton Rose	C. E. F., Ottawa	374·0	52·8	426·8	512
Houlton Rose	Indian Head	281·6	26·4	308·0	136
Irish Cobbler	Nappan	334·4	61·6	406·0	488
Irish Cobbler	C. E. F., Ottawa	338·8	52·8	391·6	448
Irish Cobbler	Indian Head	422·4	66·0	488·4	413
Irish Cobbler	Charlottetown	268·4	70·4	338·8	352
Late Puritan	Nappan	330·0	30·8	360·8	374
Late Puritan Br.	C. E. F., Ottawa	369·6	66·0	435·6	367
Late Puritan	Indian Head	303·6	39·6	343·2	455
Langworthy	C. E. F., Ottawa	348·8	35·2	484·0	233
Long Keeper	"	224·4	44·0	268·4	266
Manistee	"	352·0	52·8	404·8	387
McIntyre	Charlottetown	360·8	8·8	369·6	391
Morgan Seedling	"	290·4	17·6	308·0	356
Morgan Seedling	Indian Head	369·6	30·8	400·4	444
Morgan Pink Seedling	C. E. F., Ottawa	321·2	44·0	365·2	523
Morgan Seedling	Nappan	167·2	52·8	220·0	198
Money Maker	"	260·0	35·2	295·2	264
Money Maker	C. E. F., Ottawa	193·6	39·6	233·2	440
Money Maker	Indian Head	470·8	17·6	488·4	242
Monarch	C. E. F., Ottawa	132·0	57·2	189·2	338
New Guardian	"	154·0	48·4	202·4	396
New Chieftain	"	277·2	57·2	334·4	250
New Scotch Rose	"	255·6	30·8	286·4	631
New Queen	"	224·4	66·0	290·4	242
New Queen	Indian Head	171·6	22·0	193·6	259
New Colonist	C. E. F., Ottawa	180·4	57·2	237·6	418
Norcross	"	220·0	39·6	259·6	255
Pierremont Seedling	"	255·6	48·4	303·0	316
Provost	"	211·2	17·6	228·8	332
Pan American	"	206·8	30·8	237·6	233
Prince Albert	"	374·0	44·0	418·0	308
Puritan	Charlottetown	312·4	39·6	352·0	171
Queen of the Hebrons	C. E. F., Ottawa	96·8	8·8	105·6	88
Rawlings Kidney	Nappan	378·4	44·0	422·4	349
Rawlings Kidney	Charlottetown	369·6	35·2	404·8	396
Rawlings Kidney	C. E. F., Ottawa	312·4	48·4	360·8	360
Reeves Rose	Nappan	369·6	30·8	400·4	314
Reeves Rose	Indian Head	382·8	44·0	426·8	220
Rochester Rose	Nappan	396·0	30·8	426·8	352
Rochester Rose	Indian Head	281·6	30·8	312·4	195
Rochester Rose	Charlottetown	356·4	30·8	387·2	308
Rose of the North	C. E. F., Ottawa	136·4	35·2	171·6	173
Royalty	"	206·8	118·8	325·6	376
Rural New Yorker	Charlottetown	382·8	30·8	411·6	277
Satisfaction	C. E. F., Ottawa	277·2	57·2	334·4	387
Superlative	"	162·8	30·8	193·6	277
Scottish Triumph	"	312·4	30·8	343·2	303
Sharp Victor	"	145·2	83·6	228·8	319
Silver King	"	290·4	44·0	334·4	426
Snow	"	224·4	52·8	277·2	396
St. Patrick	"	52·8	13·2	66·0	103
Sir Walter Raleigh	"	325·6	30·8	356·4	402
Sir John Llewellyn	"	171·6	74·8	246·4	347
Table Talk	Nappan	321·2	79·2	400·4	545
Table Talk	C. E. F., Ottawa	211·2	35·2	246·4	360
Table Talk Br.	"	184·8	30·8	215·6	352
Table Talk	Indian Head	303·6	44·0	347·6	422
Table Talk	Charlottetown	281·6	83·6	365·2	442
Todd Wonder	C. E. F., Ottawa	290·4	22·0	312·4	290
The Scott	"	242·0	52·8	294·8	325
The Moreton	"	233·2	22·0	255·2	371
Up to Date	C. E. F., Ottawa	250·8	30·8	281·6	290

FREDERICTON.

VARIETIES of Potatoes Grown in Rows of 66 Hills Each.—*Concluded.*

Name of Variety.	Source of Seed.	Yield per Acre. Marketable Potatoes, 1914.	Small Potatoes, 1914.	Total Yield, 1914.	Total Yield, 1913.
		Bush.	Bush.	Bush.	Bush.
Vick Extra Early	Nappan	343·2	30·8	374·0	531
Vick Extra Early	Indian Head	290·4	44·0	334·4	158
Vick Extra Early	Charlottetown	316·8	17·6	334·4	477
Vermont Gold Coin	C. E. F., Ottawa	268·4	30·8	299·2	268
Vermont Gold Coin	Indian Head	259·6	22·0	281·6	393
Wee McGregor	Nappan	387·2	52·8	440·0	422
Wee McGregor	C. E. F., Ottawa	286·0	39·6	325·6	479
Wee McGregor	Indian Head	290·4	52·8	343·2	272
Wee McGregor	Charlottetown	290·4	57·2	347·6	446
White Chief	C. E. F., Ottawa	224·4	70·4	294·8	415
Windsor Castle	"	35·2	44·0	79·2	182
White City	"	250·8	22·0	272·8	382
McCullough, Parlee	Sussex, N.B	308·0	44·0	352·0	176
McCullough, W. H. Moore	Scotch Lake, N.B	369·6	52·8	422·4	453
Moore Green Mountain	"	391·6	39·6	431·2	380
Early Triumph	Bear Island, N.B	365·2	52·8	418·0	

Total Potato Crop.	Acres.	Bushels.	Bushels per acre.
Test for 53 fertilizer plots	2·65	555·42	209·6
Commerical field (no manure or fertilizer on this land for more than 30 years)	1·687	352·13	209·6
1913 Fertilizer plots (repeated)	1·2	156·9	130·7
General Fertilizer Experiments	1·6	440·5	252·8
Special Potash Experiments	0·35	92·0	262·8
Seed Plots	1·4	400·0	285·7
Land not included in Fertilizer Experiments	0·5	124·0	248·0
Varieties in 66-foot rows	0·666	208·0	312·0
Early Potato patch	0·25	50·0	200·0
	10·30	2,342·95	227 & 50lb

Leaving out the experimental plots of 1913 which had no fertilizer this year, and some of which had none last, only one having complete fertilizer last season, and the early potatoes, most of which were dug before they got their growth, the average per acre for this crop was 241·3 bushels. It should also be considered that the 53 plots which were being tested for relative fertility and the land between plots, aggregating 4½ acres, had no fertilizer whatever. The balance of the crop, viz., 4½ acres, yielded at the rate of 272 bushels per acre.

RADISH.

French Breakfast was decidedly the best of the three varieties grown, being ready for use 24 days after sowing seed.

FREDERICTON.

SALSIFY.

Seed of this vegetable was sown on freshly manured land, with the result that when lifted a mass of fibrous roots had formed.

SQUASH.

Ten varieties of squash were grown, of which the Green Hubbard, Golden Hubbard, and Mammoth Whale were the most satisfactory. The produce of one plant of each variety was weighed, and the results will be found in the following table:—

Variety.	Produce of one average Plant.
	lb.
Long Vegetable Marrow	110·3
Mammoth Whale	95·1
Hubbard	58·2
Long White Bush	57·3
Golden Hubbard	49·2
Delicious	37·0
Delicata	31·2
Custard Marrow White Bush Scalloped	28·8
Crookneck	25·7
White Congo	Failed to set.

TOMATOES.

Twelve varieties of tomatoes were sown in flats in hotbed on April 3, pricked out into strawberry boxes on May 15, and transplanted to open ground June 15, four feet apart each way. The ground received manure at the rate of 30 tons per acre.

The land was divided into two plots 66 feet by 48 feet, and a fertilizer test carried out. Plot A was manured with barnyard manure at the rate of 30 tons per acre. Plot B was manured with barnyard manure at the rate of 15 tons per acre and fertilizer as follows: 120 pounds nitrate of soda, 480 pounds acid prosphate, 168 pounds muriate potash per acre applied.

Each variety occupied 66 feet by 4 feet in each of the test plots. In the following table will be found the results obtained:—

Variety.	Length of row.	Yield.		
		Ripe.	Green.	Total.
	feet.	lb.	lb.	lb.
Sunnybrook Earliana	66	87·1	48·5	135·6
Rennie Extra Early	66	71·9	66·0	137·9
Northern Adirondack	66	30·7	53·3	84·0
Alacrity	66	49·0	31·0	80·0
Extremely Early	66	52·8	42·0	94·8
Florida Special	66	13·2	43·5	56·7
Prosperity	66	32·3	24·5	56·8
Johnson Jack Rose	66	27·2	11·7	38·9
Trophy	66	17·11	49·3	66·4
Chalk Early Jewel	66	9·5	22·0	31·5
Matchless	66	14·1	22·5	36·6
Livingston Globe	66	11·9	11·0	22·9

FREDERICTON.

EXPERIMENTAL STATION, STE ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

Winter was late in setting in in 1913, and very little snow fell. The temperature remained cold and the weather dry and the fruit trees wintered very well in this locality. All the snow went off at the end of March, leaving the earth hard and frozen but without any ice covering. April was cold, from beginning to end, and the earth was not entirely thawed out before the 10th of May. It was only at the end of this month that the fruit trees were in full bloom.

On the 1st of June, the flowers on the fruit trees were somewhat injured by a hard frost in some places but no damage was sustained by the orchards situated within a three-mile zone from the St. Lawrence. A fact which is worth noting is that the damages caused by the frost increased with the elevation of the orchards and their distance from the river. May and June were damp and cold, and were followed by a drought which lasted the whole of the summer.

FRUIT CROPS.

The fruit crops of all kinds, especially the European plums, which succeed very well in our district, were very promising in June. In July and August there was a very heavy drop. The crop although fairly heavy, was of inferior quality; the fruit remained small and ripened very poorly and unevenly.

The varieties of Damson plums, blue and white, the Lombard and Bradshaw, are those which seem to have suffered the most from the excessive drought of the summer. These varieties were also somewhat injured by the ripe rot or monilia. The varieties Mirabelle and Montmorency gave the best fruit of the season, but not the heaviest crop.

TREES PLANTED IN 1913-14.

Over three acres were added to the orchard this year, 486 fruit trees were planted on these three acres last spring. These trees represent the following kinds:—

Apples,	318	trees	representing	22	varieties.
Plum,	108	"	"	18	"
Cherry,	41	"	"	15	"
Pear,	19	"	"	8	"

In spite of the summer drought, these trees took root very well. They made a satisfactory growth as well as those planted in 1913-14; the growth of new wood was not very strong but this new wood ripened very well, which is still more important. Their condition in the fall was as follows:—

Apple trees, 85 per cent good, 11 per cent medium, 4 per cent dead.
Plum trees, 95 per cent good, 2 per cent medium, 3 per cent dead.
Cherry trees, all good.
Pear trees, all good.

SMALL FRUITS.

A certain number of bush fruits were planted on this Station. Owing to the lack of well-prepared soil a part of the orchard established in 1914 had to be taken for them. The bush fruits will be grown between the rows of young trees for a few years, as an intercrop.

RASPBERRY PLANTS.

One hundred and sixty-five raspberry plants, representing nine varieties of raspberries, received from the Central Farm, were planted on the 18th of May on well prepared soil. These plants, as well as the currants and gooseberries, had to be kept in nursery rows for some time and suffered a little when transplanted. Sixty-five per cent of the raspberries took well and made a satisfactory growth.

GOOSEBERRIES.

Seven varieties of gooseberries including a total of forty-two plants were planted on the 18th of May. All did well with the exception of one. The growth was very good during the summer and the new wood matured well.

CURRANTS.

Twenty-four currants representing sixteen varieties (three white and thirteen red) were planted. Two bushes died.

STRAWBERRIES.

Two hundred and ten strawberry plants, representing twenty-one varieties were planted on May 19. Ninety per cent of the plants took well and made a good growth. A small quantity of perfectly ripe fruit was harvested on six varieties.

GRAPES.

Fourteen grape vines were planted on the 18th of May, viz.: 4 Brighton, 2 Brant, 1 Canada, 2 Early Daisy, 3 Lindley, and 1 Manito. The Manito and two Lindleys died; the other plants made a satisfactory growth.

VEGETABLES.

RHUBARB.

Twenty plants of the following varieties were planted: Early Raspberry 5, Hobday Giant 5, Monarque 5, Prima Donna 5. All these plants took well and made a good growth.

TOMATOES.

No tomato seed has yet been sown in hotbeds at this Station, but eight varieties which were sown in boxes and kept at a moderate temperature came very well. They were sown on the 20th of April and pricked out in May. Owing to the cold weather and the risks of frosts, they were transplanted only on the second of June. All the varieties made a strong growth and were left unpruned.

The first ripe fruits were picked on the following varieties: Prosperity, Sunnybrook Earliana, Sparks Earliana and Alacrity, on the following dates, respectively; 7th, 10th, 12th and 17th of September. The crop was insignificant, but these varieties are mentioned because they have proven their superiority over other varieties during the year. The average weight of the crop per plant, for all varieties, was 8¾ pounds of green tomatoes. The heaviest yield per plant was 15¾ pounds (variety, Chalk Early Jewel), and the lowest, 4 pounds (variety, Sunnybrook Earliana). These observations were taken after a frost (September 24) which injured tender plants.

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ONIONS.

A row 66 feet long, of the following eight varieties was sown on the 28th of May: Danver Yellow Globe, Johnson Dark Red Beauty, Red Globe, Salzer Wethersfield Red, Long Red Wethersfield, White Globe, Yellow Globe and Rennie Extra Early.

The yield in pounds is as follows: 33, 26, 26, 37, 46, 32, 16 and 15, in the order mentioned for the varieties. The Johnson Dark Red and Red Globe are the best keeping varieties. The variety ready for the market the earliest was the Rennie Extra Early.

BEETS.

Of the six varieties of beets sown, the Cardinal Globe and Eclipse gave the highest yield. The Meteor, Red Ball and Egyptian did not give quite as heavy a yield as the preceding varieties but their beets were of better quality for table use.

CARROTS.

The Improved Nantes and Chantenay each gave a rather poor yield, but the carrots were of very good quality for table use.

CABBAGES.

Eighteen varieties of cabbage were sown in cold beds on the 24th of April and transplanted in the open on June 4th. All the varieties did well during June, but suffered heavily from the drought during the summer. The Copenhagen Market and Flat Swedish were the best of the late varieties; the Early Amager Danish and Early Paris Market the best of the early varieties.

PARSNIP.

The varieties Intermediate and Hollow Crown gave a good crop.

SALSIFY.

The variety Long White gave a good yield of the best quality.

CAULIFLOWERS.

Four varieties of cauliflower were sown on June 2nd and gave misshapen heads which did not mature. The Early Snowball and Erfurt Extra Selected gave the best results.

LETTUCE.

Ten varieties of lettuce gave a magnificent crop. The Giant Crystal Head and Improved Hanson were the first ready.

BEANS.

Nine varieties were sown. Their yields are given in the following table:—

Variety.	Date sown.	Quantity sown.	Length of straw.	Fit for use.	Date ripening.	Yield.
		Row, feet.	in.			lb.
Valentine Wax	May 28	60	16	Aug. 22	Sept. 7	$4\frac{1}{2}$
Extra Early Valentine	" 28	60	18	" 16	" 3	4
Bountiful	" 28	60	15	" 10	Aug. 26	$4\frac{3}{4}$
New White	" 28	60	18	" 29	Sept. 12	$3\frac{1}{4}$
Grennell	" 28	60	15	" 30	" 13	$3\frac{1}{2}$
Refugee or 1,000–1	" 28	60	14	" 14	Aug. 28	$5\frac{1}{2}$
Golden Wax	" 28	60	19	" 24	Sept. 5	$6\frac{1}{4}$
Extra Early Refugee	" 28	60	18	" 11	Aug. 27	6
Wardwell Kidney Wax	" 28	60	14	" 28	Sept. 10	5

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CUCUMBERS.

Three varieties of cucumbers were sown on May 28: Peerless White Spine Early Russian and Giant Pera. Sown in three hills containing three plants each, these varieties gave the following yields in the order mentioned: 32, 23 and 18 cucumbers. These vegetables were ready for use on August 17.

SWEET CORN.

Fourteen varieties of sweet corn were tried and gave the following results:—

Variety.	Sown.	One row.	Height.	Observations.
		ft.	in.	
Metropolitan	May 28	60	52	Ears short, few, not eatable.
Early Malcolm	" 28	60	40	Ready, Sept. 11. ears short.
Malakoff	" 28	60	46	Ready, Sept. 8, did not ripen.
Black Mexican	" 28	60	40	Few ears, eatable Sept. 22.
Perkins Early	" 28	60	48	Ready for use Sept. 14.
Fordhook Early	" 28	60	36	Ready for use Sept. 10, very good.
Iowa	" 28	60	30	Ready Sept. 6, ears short, very good.
Golden Bantam	" 28	60	36	Fairly good, ready Sept. 8.
Evergreen	" 28	60	48	Ears deformed and few, late.
Pocahontas	" 28	60	40	Did not succeed well this year.
Early Dawn	" 28	60	30	Good Sept. 11, fairly good, ears few.
Country Gentleman	" 28	60	48	Very few ears, late.
Extra Early Adams	" 28	60	48	Ready for use Sept. 10. Good.
Stowell Evergreen	" 28	60	48	Did not succeed any too well.

The varieties Early Malcolm and Malakoff gave the best yields this year. These observations were taken on the 24th of September, after a severe frost which greatly injured the crop. No variety ripened its grain for seed.

PEAS.

Fifteen varieties of garden peas were under test and some of them gave excellent results, as shown in the following table:—

Variety.	Date sown.	Quantity sown. Row.	Date of flowering.	Date of harvest.	Total crop, ripe grain.	Length of stems.
		feet.			lb.	inches.
Lincoln	May 28	30	July 21	Aug. 20	2½	10
McLean Advancer	" 28	30	" 8	" 10	3¾	18
Stratagem	" 28	30	" 21	" 20	3	20
Gregory Surprise	" 28	30	" 6	" 10	4	24
Thos. Laxton	" 28	30	" 6	" 10	2½	20
Early Giant	" 28	30	" 6	" 12	2	23
Dainty Duchess	" 28	30	" 14	" 18	5½	28
American Wonder	" 28	30	" 8	" 14	5¼	15
Premium Gem	" 28	30	" 8	" 10	3¼	12
Heroine	" 28	30	" 14	" 20	8½	29
Gradus	" 28	30	" 6	" 10	3½	20
Sutton Excelsior	" 28	30	" 8	" 13	4½	18
Telephone	" 28	30	" 21	" 30	6½	20
Juno	" 28	30	" 8	" 20	8¼	25
Quite Content	" 28	30	" 14	" 28	6¼	35

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POTATOES.—Test of Varieties and Results Obtained.

Variety.	Date sown.	Quantity sown.	Date of flowering.	Date ready to use.	Date of harvesting.	Total yield.
		feet.				lb.
Late Puritan	May 19	66	July 10	Aug. 18	Aug. 30	40
Hard to Beat	" 19	66	" 10	" 15	" 25	26
Carman No. 1	" 19	66	" 11	" 18	" 25	65
Carman No. 3	" 19	66	" 13	" 24	" 30	51
Table Talk	" 19	66	" 10	" 18	" 28	36
Rawlings Kidney (Ashleaf Kidney)	" 19	66	" 20	" 15	" 25	69
Rochester Rose	" 19	66	" 12	" 11	" 20	41
Irish Cobbler	" 19	66	" 15	" 10	" 18	70
Clyde	" 19	66	" 15	" 20	" 30	34
Money Maker	" 19	66	" 22	" 22	Sept. 2	56
Morgan Pink Seedling	" 19	66	" 22	" 21	" 2	63
Morgan Seedling	" 19	66	" 20	" 30	" 5	83
Warrior	" 19	66	" 22	" 15	" 2	90
Vick Extra Early	" 19	66	" 10	" 7	Aug. 18	75
Gold Coin	" 19	66	" 15	" 10	" 18	51
Acquisition	" 19	66	" 12	" 11	" 22	53
Reeves Rose	" 19	66	" 10	" 9	" 18	46
Empire State	" 19	66	" 12	" 11	" 18	51
Dreer Standard	" 19	66	" 10	" 9	" 18	50
Factor	" 19	66	" 15	" 11	" 19	57
American Wonder	" 19	66	" 12	" 11	" 19	64
Dalmeny Beauty	" 19	66	" 15	" 10	" 18	63

No traces of rot were observed on any of the tubers, and the proportion of marketable potatoes was 90 per cent for the whole. The stems remained rather short but of good colour during the whole period of growth. The yield per acre was 296 bushels 28 pounds for the whole crop.

The seed was furnished by the Fredericton Experimental Station. It was treated with a fungicide and was not attacked by any disease. Three sprayings with the following insecticide gave satisfactory results: 1½ pounds arsenate of lead, and 10 ounces Paris green in 50 gallons of water. Sprayings were given on the 4th and 16th of July as well as on the 11th of August and helped to destroy all potato insects.

SQUASH AND PUMPKIN.

Fourteen varieties of squash and pumpkin were sown in hills and gave a good crop. The varieties Long Vegetable Marrow Hubbard and Early Sugar Pumpkin attracted special attention. These three varieties as well as the Crookneck Summer were greatly admired at the Quebec and Three Rivers fairs for their size and quality.

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EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. LANGELIER.

CHARACTER OF THE SEASON.

The spring was about an average one for earliness, and the last frost occurred on May 17, when the thermometer went down to 29·2. As a rule, in this district, it is not safe to put out tender plants before the first week in June, as there is a liability of a frost occurring at the end of May. The main characteristic of the season was the prolonged drought which lasted all through July until August 11th. This dry weather hurt all herbaceous flowering plants, and considerably reduced the yield of vegetables, also of raspberries and strawberries. Ornamental trees and shrubs, fruit trees, currants and goseberries did not seem to be adversely affected. Though the first frost came on September 29, fifteen days later than in 1913, it found a few varieties of plums and nearly all the grapes not quite ripe.

HORTICULTURAL PLANTS AT THE STATION AND IN THE DISTRICT.

Vegetables gave about three fourths of an average crop, both at the Station and in the district; wire worms and the mid-summer drought were the causes of the decrease. The orchards at the Experimental Farm are too young to bear much yet, but all trees made a very vigorous growth and were in first-class condition in the autumn; in Central Quebec, the crop of apples and plums was very good, or about 25 per cent more than the average. Gooseberries and currants were nowhere affected by the dry weather and the yield was about as usual; strawberries and raspberries, however, suffered very much, and what, early in the season, promised to be a bumper crop, was only half of one. There are practically no pears, cherries or grapes grown in the district, but the pear and cherry trees of the Station made a fine growth, the latter producing some fruit, whilst the grapes did fairly well, though only one variety, the Wyoming Red, was early enough to ripen its fruit. Ornamental trees and shrubs did not suffer very much from the drought, but all herbaceous plants did, and the long border of perennials, at the Station, did not give half of the bloom which it did in 1913. Fungous diseases and insects did not affect fruit very much, but wire worms caused considerable damage to vegetables. Asters suffered very badly from "yellows."

HORTICULTURAL WORK AT CAP ROUGE.

The horticultural work at this Station is divided into three distinct parts: fruit, ornamental gardening, and vegetable gardening. The main lines of work with each are the testing of varieties for earliness, yield, quality, hardiness, and beauty, cultural experiments, propagation of best kinds, and the distribution of varieties found the best for the district.

Fruit.

The fruits grown at this Station are apples, plums, cherries, pears, grapes, currants, gooseberries, raspberries and strawberries.

APPLES.

There are now 1,113 apple trees in the orchards which comprise: (1) a block of 420 Wealthy and McIntosh spaced 17½ feet in all directions with the intention of taking out the Wealthy in a few years and leaving the McIntosh 35 feet apart; (2) a block of 300 trees, twelve each of twenty-five varieties which are reasonably sure to do well in this district, and (3) a block of 194 trees, two each of ninety-seven varieties which are on trial to see which will do best here. The trees, except in the first block, are spaced either 25 by 25 or 25 by 30.

All expenses are taken account of in connection with the block of Wealthy and McIntosh, man and horse labour, value of trees, seeds for cover crops, insecticides and fungicides, etc., so that when these trees are in full bearing it can be seen whether it pays or not to grow apples here.

The first lot of trees was planted in 1911, and out of these the following gave fruit in 1914: twelve Yellow Transparent, two Duchess, six Wealthy, three Milwaukee and one each of Okabena, Cromer, Walton, Patten Duchess, Montreal Peach, Renaud, Wolf River, McMahon White, Dyer (Pomme Royale), and Transcendent. The highest quantity from a single tree was from a Yellow Transparent, which yielded 3½ gallons of apples, or nearly half a bushel.

PLUMS.

There are 132 plum trees in the orchards, comprising 42 varieties, mostly European and American. Nearly all of them, planted in 1911, produced fruit in 1914. The finest came from Bonne Ste. Anne, Lombard and Moore Arctic, amongst the European, and from Brackett, Mankato and Sunrise, amongst the American. By far the biggest plums came from Bonne Ste. Anne. A. Wolf produced the largest quantity of fruit, which was one gallon. This is not extraordinary, of course, but there are a good many farmers who would put in trees if they knew that certain varieties produce so young, and that they can enjoy fruit from their own plantations in a very few years. The trees are planted fifteen feet in all directions.

CHERRIES.

There are fifty cherry trees representing fourteen varieties. These were planted in 1911, but were moved in 1913, which delayed them, naturally. Fruit was picked in 1914 from three Griotte d'Ostheim, three Vladimir, two French Cherry, and one each of Large Montmorency, Minnesota Ostheim, Griotte Morello, and Orel. The largest yields were from Large Montmorency, Griotte Morello and French Cherry; whilst the nicest cherries were from Large Montmorency, Orel and Vladimir. The trees are spaced 15 by 15.

PEARS.

There are eleven pear trees of the following varieties: Clapp Favourite, Duchesse d'Angouleme, Flemish Beauty and Seckel. Every one of these, planted in 1911, made a vigorous growth but none produced fruit so far. The space between the trees is 25 by 30 feet.

GRAPES.

Only one variety, Wyoming Red, was ripe when the first frost came, on September 29, though the following had well coloured fruit then: Brant, Canada, Campbell Early, Champion, Florence x Potter, Lindley, Manito, Peabody, Potter x Florence. Grapes were quite green at the above mentioned date on Brighton, Early Ohio, Hartford, Merrimac, Pattison, Potter, Rogers 17, Wilkins. It is probable that only two or three varieties will be of any use in this district, but the only way to be perfectly sure of this is to try all those which are most likely to succeed.

CAP ROUGE.

CURRANTS.

There are 192 bushes, comprising sixteen varieties of black, twelve of red and three of white. The average yield, in pounds, per acre, was 6,329 for the blacks, 3,863 for the reds, and 2,480 for the whites. All these were planted in 1911 and in 1912. Amongst the blacks, the earliest was Eclipse, which had fruit ready for market on July 14, and which produced at the rate of 7,562 pounds per acre. The best yielder was Climax with 11,011 pounds per acre; one bush of this variety produced at the rate of 12,342 pounds per acre. The finest fruit came from Climax and Boskoop Giant. The earliest of the reds was Red Dutch, ready also on July 14, and giving 5,203 pounds of fruit per acre. The best yielder was Fay, with 7,744, whilst one plant of Perfection yielded at the rate of 14,151 pounds per acre. The finest fruit was from Perfection, Fay, Wilder and Red Cross. White Cherry was the earliest amongst the whites, fruit being ready for market on July 14, the same time as for the earliest black and the earliest red. This variety yielded 2,299 pounds per acre, whilst the most productive, White Grape, gave 3,025.

GOOSEBERRIES.

Twelve varieties are on test, of the green, red, and yellow kinds. The average production was 9,222 pounds per acre, whilst the highest yielder was Silvia with 14,520 pounds. A bush of this variety produced at the rate of 18,513 pounds of fruit per acre, which is about what corn for ensilage yields in this district. The earliest was Houghton, which was ready for market on July 27, thirteen days after the first currants, and gave 6,534 pounds. The finest fruit, amongst the reds, came from Silvia, Industry, Josselyn (Red Jacket), and amongst the green, from Pearl, Mabel, Downing.

RASPBERRIES.

Besides a commercial block of half an acre of King and Herbert, there are eleven varieties on test. The average production per acre was only 1,838 pounds and the highest yielder was a purple Columbian, which gave 4,335 pounds. This variety, however, is of such poor quality that it can readily be left out. The next highest yielder was Count, with 4,033 pounds, and a plant of this variety gave fruit at the rate of 6,655 pounds per acre. The earliest ready for market was King, which produced 2,306 pounds per acre. The finest raspberries came from Herbert, King, Loudon; the fruit standing shipment best was from King, Loudon, Marlboro; and the ones which seem the most desirable for domestic use were Eaton, Herbert, King.

STRAWBERRIES.

A new strawberry plantation of about half an acre in area was started in 1914, and will come in a regular rotation of sweet corn (manured), strawberries, strawberries, strawberries, and green peas. Eighteen varieties are under test, and Excelsior proved the earliest, with fruit ready for use on June 24, and yielding 2,026 pounds per acre. The most productive was New Globe with 6,969 pounds per acre, but the fruit is not uniform enough and too light coloured for the market. Amongst the best are Uncle Jim, Senator Dunlap, Glen Mary, for main crop; also William Belt and Nettie, for late varieties.

VEGETABLES.

Two hundred and eighty-two varieties and strains of vegetables were tested in 1914, and notes kept for each as to time of sowing, germination, pricking out, transplanting, blooming, ready for use, yield, etc.

CAP ROUGE.

POTATOES.

Twenty-two varieties of potatoes were tried and the average, for the lot, was 225 bushels of marketable tubers per acre. After 1915, when most of the varieties will have been tried for five years, a good number of the low yielding kinds can be dropped. The following table gives details for 1914:—

YIELD of potatoes at Cap Rouge in 1914.

	Marketable.		Small.		Total.		Rank.		
							Marketable.	Small.	Total.
	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.			
Morgan Seedling Pink	361	37	11	00	372	37	1	7	1
Morgan Seedling	338	48	11	00	349	48	2	7	2
Irish Cobbler	290	24	13	12	303	36	3	6	3
Vick Extra Early	264	49	6	36	271	25	4	9	6
American Wonder	259	36	13	12	272	48	5	6	5
Warrior	246	24	30	48	271	12	6	3	7
Late Puritan	233	12	17	36	250	48	7	5	8
Rochester Rose	232	19	8	48	241	7	8	8	10
Table Talk	232	19	41	48	274	7	8	1	4
Carman No. 3	228	48	2	12	231	00	9	10	12
Dreer Standard	222	12	8	48	231	00	10	8	12
Money Maker	213	40½	8	48	222	28½	11	8	13
Acquisition	209	00	39	36	248	36	12	2	9
Carman No. 1	206	48	8	48	215	36	13	8	14
Factor	203	13½	30	48	234	1½	14	3	11
Dalmeny Beauty	202	24	11	00	213	24	15	7	15
Rawlings Kidney (Ash Leaf Kidney)	200	12	6	36	206	48	16	9	18
Reeves Rose	198	00	13	12	211	12	17	6	16
Clyde	189	12	19	48	209	00	18	4	17
Gold Coin	178	28½	17	36	196	4½	19	5	19
Hard to Beat	134	28½	11	00	145	28½	20	7	20
Empire State	121	16½	2	12	123	28½	21	10	21
	4,969	11½	334	24	5,295	35½	......	......	....

Besides the trial of varieties, some selection work is done, using the individual hill method. The average number of potatoes from 415 hills was 10·78, whilst it was 15·1 for the best ten, and the total weight of tubers per hill was 4·18 pounds for the 415 hills whilst it was 6·51 pounds for the best ten. The produce of each of these ten best hills will be planted separately in 1916 and a couple of the best strains kept for 1917.

BEANS.

The Lima is hardly ever grown in this district and attention should specially be paid to the "kidney" sorts. Of these, the "wax" or "butter" varieties are in most demand, but it is possible that when consumers find out the excellent quality of the green podded kinds, such as Stringless, a better market will be found for them. Thirty-one varieties and strains were tried: the heaviest yielder was from a two year Cap Rouge selection of Keeney Rustless Wax, whilst the earliest ready for market was from a Cap Rouge strain of Davis Wax. The above two varieties, with Challenge Black Wax and Wardwell Kidney Wax seem to suit our conditions very well.

BEETS.

Table beets are generally classified according to their shape, that is, long, half long, top, oval, globe, flat globe, and turnip. The first two are often better keepers than the others and remain in good shape until late in the spring. As a rule, the nearer beets

are to the turnip shape, the earlier they are. On our markets, here, the round ones sell best, especially if the flesh is of a rather dark colour which remains so after the vegetable is cooked. Eclipse and Meteor were the two heaviest yielders, but as the first one comes truer to type than almost any other kind, is quite early, of good quality, and of flat globe shape, it can be recommended.

CABBAGE.

The Red Cabbage is not used very much in the district, but Danish Stonehead Red can advantageously be used by persons who like this vegetable. The Savoy varieties with their delicious taste and great tenderness, are not prized as highly as they should be; Extra Early Midsummer is one of the good ones amongst the wrinkled. Of the early varieties, Copenhagen Market continued to show its superiority over the different families of Jersey Wakefield. The heaviest yielder of all was Flat Swedish. For keeping through winter, we have found nothing yet to beat a good strain of the Danish Ballhead group. To come in between the early and late kinds, Succession is a very good one.

CARROTS.

Carrots are hard to classify, but they can be divided into blunt rooted and pointed; of each kind, there are the short, the half long or intermediate, and the long. Generally speaking, the shorter the carrot is, the earlier, and for quality, the long ones, as a rule, cannot compete with the others, as they seem to get too coarse and fibrous. For the first part of the season, French Horn or else Oxheart would suit well, whilst for a general crop, Improved Nantes and Half Long Chantenay are good. The latter is the one which does best here.

CAULIFLOWER.

To succeed with this vegetable is hard at all times, and it seems that for this district, a very early or a late kind has to be chosen, so that either may escape the heat of middle summer, when heads are formed. Early Snowball probably makes the finest head when it is rightly grown and it seems to be the leader amongst the early kinds. We have had, however, better success with Veitch Autumn Giant and it cannot yet be said if one can be recommended to the exclusion of the other.

CELERY.

Everybody wishes to have the white sorts and the green kinds are not asked for, though, in reality, they are often of much better quality than the so-called self-blanching varieties. Paris Golden Yellow is replacing White Plume for early marketing, whilst for keeping over winter, growers seem to yet depend mostly upon the old Giant Pascal.

CORN.

Early Malcolm, which is a selection of Malakoff made at the Central Experimental Farm, Ottawa, is the best sweet corn for this district. There are varieties of better quality, such as Golden Bantam, but they are too late; there are earlier varieties, such as the common corn grown in the lower St. Lawrence but they are not table kinds. The average of four years places Early Malcolm way ahead of its nearest competitor for number of ears produced, it having beaten it by over 47 per cent.

CUCUMBERS.

Of the small varieties for pickling, either Boston or Chicago Pickling is good; of the large ones, the numerous strains of Early White Spine cannot very well be surpassed. Here, as for tomatoes, there is often more difference between different strains of one variety than between different varieties.

CAP ROUGE.

LETTUCE.

The Cos varieties are hardly known in this vicinity and the curled kinds are losing ground all the time, except for forcing, when Grand Rapids easily leads them all. The market requirements call for the "head" or "cabbage" sorts, and the "butter" sub-classes are more in demand than the crisp ones. All Heart, Iceberg, and Victoria are the ones which should be recommended here.

ONIONS.

The Large Red Wethersfield is the most productive of the varieties tried here and as it is a very good keeper, under our climatic conditions, it is the one which is, to the present, most worthy of recommendation. Persons preferring a lighter coloured sort can use Yellow Globe Danvers, and for those who look for size and appearance of bulb, nothing can beat Prizetaker. In onions, one has to be very careful in using good strains, as there is often more difference between the different strains of one variety than between the varieties themselves.

PARSLEY.

A new variety, from Denmark, Dwarf Perfection, has shown such superiority over the others that it seems to be in a class by itself. It is certainly the most promising novelty tried at Cap Rouge in 1914. If it does as well in 1915, it should certainly supplant all others.

PEAS.

Fifty-two varieties and strains were tried. One of the Station selections of Sutton Excelsior was the heaviest yielder. As usual, Gregory Surprise was the earliest and as it is also very productive, it is the one which is recommended to farmers of the district. Other good kinds, in order of earliness, are Thomas Laxton, McLean Advancer, and Stratagem.

RADISHES.

The two varieties which were the highest yielders were from seed grown at this Station: Turnip Early Scarlet White Tipped and White Icicle. The first produced a little more and is better liked on the market on account of its fine colour. The latter, however, can remain longer in the ground without getting woody. The well known, much-heralded as to quality, French Breakfast, does not seem to do very well or to be in demand in this district.

SQUASH.

The Long Vegetable Marrow was easily the heaviest yielder and is also a good seller. The Crooknecks, though really of better quality, are not liked because there is too much waste in peeling. For persons with limited areas at their disposal, nothing can be better than the Long White Bush Marrow, as it grows upright instead of trailing around in all directions.

TOMATOES.

A new variety, Danish Export, was three days earlier than anything else in 1914, and it gave the smoothest, though the smallest, fruit. The heaviest yielder of total ripe fruit was Prosperity which held the same distinction in 1913. It is, however, about ten days later than the different strains of Earliana, and an unusually short season might make a big difference. Alacrity, which is a selection of Earliana made at the Central Experimental Farm, Ottawa, is, to the present, the one which can be recommended for central Quebec, because it gives a rather large percentage of ripe fruit at an early date.

TURNIPS.

Consumers of this district do not like the white turnips, but rather prefer the purple tops. Of the first, Extra Early White Milan was the heaviest yielder. The Purple Top Milan, though producing less, was sold much more easily.

OTHER VEGETABLES.

Besides the above, the following were grown and can be recommended for central Quebec: Brussels sprouts, Dwarf Improved; Parsnip, Hollow Crown; Salsify, Long White; Spinach, Victoria.

ORNAMENTAL GARDENING.

The drought of the early part of summer was not conducive to the best development of the new lawns, but they pulled through with the increased precipitation of September and October. The same thing applies to the ornamental trees and shrubs. Amongst these, some that did well are *Forsythia intermedia, Neillia opulifolia aurea, Philadelphus grandiflorus, Amorpha fruticosa, Spiraea arguta, Spiraea bracteata, Spiraea japonica (callosa), Spiraea salicifolia, Spiraea Van Houttei.* The last named was fairly covered with bloom and admired by all visitors. All the Syringas, especially the ones planted in 1913, did well and made a fine, strong growth. The Loniceras were very pretty, whilst *Hydrangea paniculata grandiflora* did not do very much, probably on account of the dry weather. Of the conifers, none did very well, but *Larix europaea, Juniperus communis fastigiata,* the Piceas, and the Thuyas are looking fairly good. Amongst the hedges, *Berberis Thunbergii* has done better this year than before, and so did *Picea pungens* whose fine blue colour is very much admired. The one most liked by visitors is *Thuya occidentalis,* but it is probable that when they are all well grown, *Juniperus communis fastigiata* will be found the prettiest. *Cornus alba sibirica* is a strong grower but not prized as much as the evergreens. The roses were much admired and the flowering season was lengthened by many of the varieties blooming for a second time in the autumn. On the perennial border, drought kept things back, but amongst the plants which did the best were the Oriental Poppy, the Aquilegias, Lupinus, *Hesperis matronalis,* the Campanulas and the Delphiniums. Hollyhocks bloomed profusely, but the dry weather caused the flowers to droop very soon. Annuals were shorter and the blooms not quite so good as in 1913, on account of lack of rain.

Notes had to be taken on about 1,401 varieties of ornamental plants: 269 annuals, 478 perennials, and 654 ornamental trees and shrubs.

CULTURAL EXPERIMENTS IN ORCHARDS.

The general practice, in the orchards, is to leave on each side of the rows of trees a space of four feet, which is cultivated until about July 1, and then sown to a cover crop. This is to encourage as much growth as possible early in the season, and stop as much as possible all growth in the latter part of summer, so that the wood may have time to mature before the heavy frosts of winter. Between these spaces, a three year rotation of roots, oats and clover has been started. As the trees grow, the cultivated strips on each side will be wider and the space devoted to the rotation narrower.

To find out the effect on the growth of trees, on their yield, and on their condition, an experiment has been started, to compare clover, rape and vetches, as a cover crop, and also with rape followed by clover, and lastly with permanent sod. In the latter case, the hay is cut and left on the ground for a certain part, whilst for the other it is cut and taken away. As this experiment is in a commercial orchard of 420 trees, all McIntosh, with Wealthy as fillers, and the ground is fairly uniform, it will be interesting to note results, the more so because notes are kept for each individual tree.

CAP ROUGE.

Cultural Experiments with Vegetables.

Cultural experiments are being started with the principal kinds of vegetables. With beans and peas, there will be a comparison of relative advantages of a succession of varieties of different seasons with the same variety planted at intervals of a week apart for four weeks; with cabbage and cauliflower, different devices, such as felt paper discs and cheap cheese cloth individual covers will be tried to protect the plants from root maggots; with beets, carrots and parsnips, thinning at different distances will be tried; with celery, different methods of blanching will be compared; with onions, seed sown in the open and thinned at different distances will be in competition with plants started early inside, and with onion sets, whilst these will be grown from different varieties, and lastly, there will be a test of various methods to control maggots; with tomatoes, tying to stakes and to wires, pruning to one and two stems, transplanting once or twice, ripening fruit in various ways when there is danger of frost, will be very interesting experiments; with rhubarb, seed will be sown each year for three seasons to find out how long it takes to grow plants large enough to cut, also to force, and different ways of forcing in the cellar will be tried; with potatoes, buds taken from different parts of the tubers will be compared, also whole small potatoes with sets cut from medium to large ones cut to 1, 2, 3 and more eyes; then the number of cultivations, the level or ridges system, the distance apart of rows and sets in the rows, the cost of growing half an acre or more, sprouted vs. unsprouted, mulching to obtain stronger seed, sets cut and coated at once with gypsum or land plaster as against not coated, planting at different dates, are many experiments which will be valuable when results of a few years are available.

Improvements of Varieties and Propagation of Best.

In fruit, seedlings are grown of the varieties of apples, plums, cherries, gooseberries, currants, raspberries and strawberries which have shown themselves ahead of the others for yield or earliness. For apples, roots are grown at the Station, and for grafting, scions are used from trees whose records are the best. The same thing is done in propagating gooseberries, currants and strawberries; all of these, which are grown here, come from individual plants of more than ordinary merit. It is possible that the road to extraordinary success, even with these methods, is a long and tortuous one, but it will certainly be very interesting to note results.

With vegetables, selection only has been resorted to, but it is intended to make a few crosses in 1915. In this connection it is well to say that seed has been grown of the following kinds in this northern latitude: beans, corn, cucumber, lettuce, muskmelon, peas, pepper, pumpkin, radish, squash, tomato, turnip, watermelon. Besides this, beets, carrots, onions, parsnips have been kept over successfully, in the ground, and will produce seed in 1915.

The good results obtained to date with home-grown seed would tend to show that farmers and truckers would find it profitable to produce seed of at least a few of the different kinds of vegetables which they grow.

Distribution.

Young apple trees, gooseberries, currants, raspberries, strawberries, ornamental plants, flower seed, sweet corn, garden peas, and tomato seed were distributed in the spring of 1915. This was commenced in 1912, at the request of a few farmers who desired to have varieties adapted to the climate and conditions of this district, and though it was never advertised in the papers, nor any means taken to increase the number of applicants, these are getting so numerous that there can be no doubt of the popularity of the distribution. It will either have to be limited or the office force

increased, as the correspondence occasioned by it is getting quite heavy. With each lot sent out is a letter advising the person who receives the goods that questions on an enclosed circular must be answered if the name is to remain on the lists for further distributions. At the same time a bulletin or a circular letter giving instructions as to the best methods to use for the seed, or plants, or trees forwarded is sent, so that the distribution is certainly of great educational value. Not only this, but from the reports received from these men, who become interested co-operators, much information is gathered which is of benefit to the Station. In 1916, it is the intention, with the card record system covering this part of the work, to refuse seed or plants to persons who have already had the same thing, and to encourage them to grow seed and propagate plants themselves.

Exhibitions.

Horticultural products from Cap Rouge were exhibited at the three largest shows of the province of Quebec: Three Rivers, Quebec, and Sherbrooke. Fruit, vegetables and flowers were on display, and it can be said that this was very attractive. The educational side was never forgotten, tomatoes, for instance, being placed near each other. Some of these were perfectly ripe, whilst other varieties, sown at the same time, were green. One or two men, perfectly competent to give visitors all reasonable information asked for, were in attendance all the time, and blank forms were on hand for people who wished to get any publication issued by the Experimental Farm system. In the province of Quebec, exhibitions are visited by a great number of farmers who probably would never care to come to an Experimental Farm. It has been remarked that quite a few of these, interested in the various displays, ask questions and talk quite a bit with the men in charge. From this, good results are sure to come, as these farmers get in closer touch with the Experimental Farm system and quite often afterwards come and visit the Station.

EXPERIMENTAL STATION, LENNOXVILLE, QUE.

REPORT OF THE SUPERINTENDENT, J. A. McCLARY.

The Lennoxville Experimental Station for the Eastern Townships is situated in the valley of the St. Francis river, in the southeastern part of the province of Quebec, 25 miles from the boundary line of Vermont state, and was only started in the spring of 1914; therefore there is very little to report on, but it is hoped to have things well under way for the continuance and progress of this branch of the work another year.

One of the first things done at the opening of this Station was the planting of a nursery of ornamental trees and shrubs for future use, which have done very well through the summer, and after this winter it will be possible to report on their hardiness at least as small plants. Also there have been set out twenty-six varieties of strawberries which will be ready for permanent planting in the spring.

VEGETABLES.

TOMATOES.

One-half acre of land was used for tomato plants of different strains which had been bred on the Central Experimental Farm, and the plants sent to us. We found Alacrity crossed with Ponderosa a very prolific variety, with Alacrity crossed with Dwarf Stone not far behind, being a very abundant bearer and fruits almost free from cracks.

CORN.

Fifty-four different varieties of sweet corn were planted on June 5. The season was not very good for corn, so most of these varieties did not mature sufficiently for use. We found Early Dawn to be the earliest and of very good quality, Early Malcolm next, and Malakoff not far behind.

POTATOES.

There were planted for hill selection six different varieties of potatoes, namely: Carman No. 1, Empire State, Early Ohio, Green Mountain, Irish Cobbler and Gold Coin, of which a hill selection was made for planting next spring. In these varieties, 100 hills were selected of each with which were compared 100 hills as they came in the rows. It was found that they varied from 66 to 181 pounds. The potatoes from the selected hills weighed 181 pounds and from the unselected 66 pounds. We hope with this hill selection to be able to raise seed for distribution in a year or two which will be of great benefit to the farmers in this district.

FLOWERS.

Several varieties of perennial flower seeds were planted on July 16, which came on very well. They have been transplanted into beds, and we are very pleased to say that many of them were in bloom when winter set in. A collection of tulips, narcissus, and hyacinths was planted this autumn, from which there should be a good show next spring.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

The season of 1914 opened with favourable conditions for horticulture, but the fair promises of spring were not fulfilled by the months of summer. From June 1 until September the rainfall was very light and mostly in scattered showers that did no good. Combined with dry weather were excessive heat and hot winds. As a result, horticulture did not fare very well. Persistent cultivation insured a reasonably good crop of vegetables. Tomatoes in particular having been given plenty of room, thrived in the heat. But potatoes, fruits, lawns and flowers, did very poorly. In September and October there were some showers which revived the grass and helped any crops that were late enough to be benefited.

FRUIT.

CRAB APPLES.

A large crop of crab apples was harvested from many of the hybrid trees originated by the late Dr. William Saunders, formerly Director of Experimental Farms. These trees were produced by crossing standard apples with *Pyrus baccata,* a wild Siberian apple of great hardiness but bearing very small astringent fruit. The resulting hybrids are the hardiest crab apples for use in Western Canada, and though not suitable for eating raw, they make very good preserves or jelly. Some of the best are, Silvia, Elsa, Robin, Tony, Norman and Charles.

A large number of seedlings from these hybrids have been tested. Most of them are of no value, but a few trees prove valuable. Two in particular, both seedlings of Cluster, are the most productive trees in the orchard and bear fruit of fair size and good quality.

STANDARD APPLES.

Not much success can be reported with the larger types of apples. The location is a hard one and none of the trees tried as yet are entirely satisfactory. Some fruit was produced this year as is the case practically every year, but as yet no standard apple tree has borne regularly and productively on this farm.

In order to develop a hardier type of standard apple, if such is possible, a large number of seedlings are being grown. About ten thousand seedlings of the hardiest varieties, varying in age from one to three years, are now being produced on this Farm. It is hoped that this large number will give sufficient variation so that it will be possible to select a type of sufficient hardiness to stand our climate and yet bear fruit of reasonable size and quality.

PLUMS.

The plum crop was not as large as usual, being lowered somewhat by the heat and drought. Nevertheless, a very satisfactory yield was obtained. The best strains of native plum are the most desirable under test. One of these, known as Major, is the earliest in the orchard and produces fruit of good flavour and medium size. The Cheney variety is quite hardy and of good quality, but a little late for this climate. The Aitkin is also quite hardy, but is flat and insipid in flavour. A number of the

new varieties produced by Prof. Hansen of South Dakota are being tested, but the results are not very satisfactory as yet. The trees seem scarcely hardy enough for this climate.

CURRANTS.

The following varieties of red currant were set out in a new plantation in 1913: Wilder, Red Cross, Red Grape, Red Dutch, Cherry, Greenfield Red, Victoria Red, Cumberland Red, Pomona, Rankin Red, Raby Castle, Perfection. All have grown well and wintered well. Red Cross gave the best yield in 1914.

The following varieties of black currant were set out at the same time: Topsy, Eagle, Success, Climax, Collins Prolific, Victoria, Eclipse, Saunders, Clipper, Buddenborg, Kerry, Magnus. All grew well and wintered well. The best yield in 1914 was produced by Buddenborg.

Three varieties of white currants were set out at the same time: White Grape, White Cherry, and Large White. All three have done well. Large White produced slightly more than either of the other two.

GOOSEBERRIES.

Eighteen plants each of the Houghton and Downing gooseberries were set out in 1913. Houghton wintered well and produced 27 pounds of fruit in 1914. Downing was badly injured during the winter and produced practically no fruit.

RASPBERRIES.

Nine varieties of raspberries were planted out in 1913. The following were more or less winter-killed and produced little or no fruit in 1914: Turner, Loudon, King and Ironclad. The best producer in 1914 was the Caroline, a yellow raspberry of small size, medium flavour and rather poor appearance. The second best was Sunbeam, a small red raspberry of rather poor flavour; the third was Herbert, a fine, large, handsome berry of first-class flavour. Miller also produced well and the fruit was of good size and flavour.

We do not consider this test as decisive, as some of the varieties that have failed to produce this year have been considered among the best. The results of the years that follow may make a difference.

STRAWBERRIES.

A new strawberry plantation was set out this year and no results are obtainable as yet. The varieties that have given best results in previous years are: Pocomoke, Senator Dunlap, and Bederwood.

VEGETABLES.

POTATOES.

The usual tests of varieties of potatoes were conducted again this year. Four 68-foot rows were grown of each variety. The season was very unfavourable and potatoes were from a half-crop to a failure all over Manitoba. The results for 1914 and the average for the past five years are as follows:—

Variety.	Form.	Colour.	Size.	Time of Maturity.	Yield per Acre. 1914. Bush.	Yield per Acre. 1914. lb.	5-year average. Bush.	5-year average. lb.
Grown for 5 Years or More.								
Empire State	Long	White	Large	Medium	234	40	513	40
Rawlings Kidney	Long	White	Large	Late	237	25	487	23
Woodbury White Rose	Long	White	Medium	Medium	260	5	468	9
American Wonder	Long	White	Large	Late	261	15	448	37
Manitoba Wonder	Long	Red	Medium	Medium	267	40	444	24
Reeves Rose	Long	Pink	Medium	Medium	214	30	443	14
Early Ohio	Round	Pink	Large	Early	275	00	440	14
Late Puritan	Long	White	Large	Late	186	5	435	39
Morgan Seedling	Long	Light pink	Large	Medium	166	50	429	00
Irish Cobbler	Round	White	Large	Early	202	35	421	29
Peacock Surprise	Long	Russet	Medium	Medium	176	00	407	00
Early White Prize	Long	White	Small	Early	218	10	406	16
Hamilton Early	Round	White	Large	Early	217	15	396	33
Gold Coin	Oval	White	Large	Late	258	30	360	52
Grown for 4 Years Only.								
Table Talk	Long	White	Large	Late	181	30	581	11
Early Bovee	Medium long	Pink	Medium	Early	209	55	435	39
Grown for 3 Years Only.								
Wee McGregor	Oval	White	Large	Late	238	40	479	30
Grown for 2 Years Only.								
Early Norther	Long	Pink	Large	Early	278	50	398	45
Houlton Rose	Long	Pink	Large	Early	259	25	372	45
New Queen	Oval	Pink	Medium	Early	242	55	361	37
Early Hebron	Oval	Pink	Medium	Early	234	40	354	45
Grown for 1 Year Only.								
Lightning	Oval	Lightpink	Medium	Late	282	20		
Early Snowdrop	Long	White	Small	Early	220	00		
Ashleaf Kidney (English type)	Long	White	Small	Early	196	44		
Snider Best Early	Round	Red	Medium	Medium	166	50		

For main crop varieties, Empire State, Rawlings Kidney, Wee McGregor, and Table Talk are recommended. Table Talk gave exceptionally high yields in 1911, 1912 and 1913, but this year it suffered very severely in the dry weather and was one of the lowest in yield. This was true in a lesser degree of all late varieties. The early varieties were better developed at the time of the drought and consequently suffered less severely. Among the best early varieties are Early Ohio, Early Bovee and Early White Prize.

COOKING TEST.

A cooking test of the varieties of potatoes was made this year. The notes taken are presented in tabular form as follows:—

BRANDON

Variety.	Character of Surface.	Flavour.	Texture.	Dryness.	Remarks.
Empire State	Smooth, medium shallow eyes	Very good	Fine	Dry	Cooks very slowly.
Rawlings Kidney	Smooth, medium shallow eyes	Very good	Fine	Dry	
Woodbury White Rose	Fairly smooth, fairly shallow eyes	Good	Medium	Medium	
American Wonder	Fairly smooth, fairly shallow eyes	Very good	Fine	Dry	
Manitoba Wonder	Rather rough, medium deep eyes	Good	Medium	Very dry	
Reeves Rose	Fairly smooth, fairly shallow eyes	Good	Medium	Dry	Cooks quickly.
Early Ohio	Fairly smooth, fairly shallow eyes	Very good	Fine	Dry	
Late Puritan	Smooth, shallow eyes	Very good, sweet	Very fine	Dry	
Morgan Seedling	Fairly smooth, fairly shallow eyes	Good	Medium	Rather moist	Cooks slowly.
Irish Cobbler	Very deep eyes	Very good	Fine	Dry	
Peacock Surprise	Very smooth, very shallow eyes	Very good	Fine	Dry	Very white flesh.
Early White Prize	Fairly smooth, fairly shallow eyes	Good	Medium	Dry	
Hamilton Early	Smooth, shallow eyes	Good	Very fine	Dry	Cooks very quickly.
Gold Coin	Fairly smooth, rather deep eyes	Medium	Fine	Moist	Cooks very slowly.
Table Talk	Smooth, very shallow eyes	Good	Rather coarse	Rather moist	
Early Bovee	Fairly smooth, fairly shallow eyes	Good	Rather coarse	Dry	
Wee McGregor	Smooth, fairly shallow eyes	Very good	Fine	Dry	Very white flesh.
Early Norther	Fairly smooth, fairly shallow eyes	Good	Rather coarse	Dry	
Houlton Rose	Rather rough, deep eyes	Good	Medium	Medium	Yellow flesh.
New Queen	Smooth, medium shallow eyes	Good	Fine	Dry	
Early Hebron	Rather rough, deep eyes	Good	Medium	Medium	

BRANDON.

FERTILIZER TEST WITH POTATOES.

In order to test whether it would be profitable to use commercial fertilizers on good Manitoba soil, a fertilizer test has been carried on for three years. Summer-fallow land has been used each year. The quantities of fertilizers used would cost about $9 or $10 per acre for each single kind and three times that amount for the complete fertilizer. The results obtained were as follows:—

Fertilizer Used	Yield of Potatoes per Acre. 1914.		Yield of Potatoes per Acre. Average of three years.	
	Bush.	lb.	Bush.	lb.
No Fertilizer	245	40	372	10
Muriate of Potash (320 pounds per acre)	247	30	394	10
Acid Phosphate (600 lb. per acre)	229	10	337	10
Sulphate of Ammonia (160 pounds per acre)	220	00	392	57
Complete Fertilizer—				
Muriate of Potash (320 pounds per acre)				
Acid Phosphate (600 pounds per acre)	252	25	431	8
Sulphate of Ammonia (160 pounds per acre)				

It will be observed that the increased yield is hardly sufficient to justify the cost of fertilizer.

DISTRIBUTION.

A distribution of 397 samples of seed potatoes was made in the spring of 1914.

ASPARAGUS.

A bed of asparagus that has been in use for a considerable number of years again produced a crop of very acceptable early vegetable. It was ready for use on May 6. This vegetable is well worth more general use. It requires very little attention, and coming into use so early, is a real treat.

BEANS.

Ten varieties of beans for use as string beans were tested this year. Very little difference in earliness was observed, as the heat brought them all on together. Wardwell Kidney Wax is a yellow variety of good quality, among the earliest, and is therefore recommended.

BEETS.

Ten varieties of beets were tested this year. Among the best for table quality are Black Red Ball and Ruby Dulcet. Extra Early Turnip also gave good results.

CABBAGE.

Twenty varieties of cabbage were tested this year. Results were very unsatisfactory as nearly all the heads split open when the rains came in September after the drought. Early Paris Market is recommended for early use. Copenhagen Market is probably the best all-round cabbage considering quality, yield and earliness.

BRANDON.

CAULIFLOWER.

Extra Selected Early Erfurt gave best results this year, being ready for use on July 18th, and producing 14 pounds 9½ ounces from ten average heads. Early Snowball is also a good reliable variety.

CARROTS.

Four varieties of carrots were tested; Half Long Chantenay and Improved Nantes are the best.

CELERY.

Celery was a failure this year. No water was used on any crop in the vegetable garden, and celery showed itself to be the only crop that was unable to get along without artificial watering in a dry year. White Plume is the finest quality of the varieties under test here and is recommended for home use on that account.

CITRONS.

Red-Seeded, Colorado Preserving and Graham's were tried. Little difference was observed as to their desirability; all did well. Graham's produced 145 pounds of fruit from 12 plants.

CORN.

Thirteen varieties of table corn were tried this year. As is the case every season, excellent results were obtained. The corn was planted on May 16th in rows 3 feet apart with the hills 3 feet apart in the rows.

Variety.	Ready for use.	Table Quality.	Height.		Yield of 12 Hills.	
					Number of Ears.	Weight of Ears.
			ft.	in.		lb.
Squaw	July 31	Fairly tender, fair flavour	4	8	33	14
Improved Squaw	Aug. 5	Fairly tender, fair flavour	5	0	36	16
Early Malcolm	" 10	Tender, good flavour	4	6	32	12¼
Early Malakoff	" 10	Tender, fairly good flavour	4	2	54	11
Extra Early Adams	" 10	Tender, fairly good flavour	5	4	25	9
Northern Success	" 11	Tender, fairly good flavour	4	9	49	14
Early Dawn	" 11	Fairly good	4	0	54	13
Early Iowa	" 11	Fairly good	4	6	45	16½
Fordhook Early	" 17	Very tender, good flavour	5	0	42	13
Pocahontas	" 17	Very tender, very good flavour	5	10	33	9
Perkins Early Market	" 18	Tender, good flavour	7	0	38	15½
Henderson Metropolitan	" 18	Very tender, very good flavour	6	0	47	15
Golden Bantam	" 18	Very tender, exceptionally fine flavour	5	3	30	12

It is advisable to use three varieties in a Manitoba garden. A few hills of Squaw corn will ripen very early in the season. The Squaw corn seems very good at this time when the better varieties are not available. Then, a few hills of Malakoff or Extra Early Adams will follow after the Squaw. Then, the bulk of the plot should be Golden Bantam; once this variety is tasted none of the others satisfies.

CUCUMBERS.

Six varieties of cucumbers were tested this year. One, Giant Pera, did not germinate. McKenzie Prolific gave the largest yield and was also the first to be ready for use.

BRANDON.

LETTUCE.

Fourteen varieties of lettuce were tested this year. They were all sown April 23. The results were as follows:—

Variety.	Ready for use.	Length of Season.	Table Quality.	Weight of one Average Plant.	
		days.		lb.	oz.
Red Edged Victoria	June 22	4	Medium flavour and texture	0	3
Rousseau Blond Winter	" 23	3	Medium, tough leathery texture	0	3
Unrivalled Summer	" 26	4	Medium in flavour and texture	0	10
All Heart	" 30	18	Very good flavour, crisp and tender	1	3
All-the-Year-Round Butter-head	July 6	10	Good flavour, crisp and tender	1	1
Denver Market	" 8	15	Very good flavour, very crisp	1	2
Black-Seeded Simpson	" 8	8	Good flavour, fairly crisp	0	12
Grand Rapids	" 8	12	Medium flavour, medium texture	0	10
Giant Crystal Head	" 10	14	Very good flavour, very crisp and tender	1	1
Hanson Improved	" 10	14	Fairly good flavour, medium texture	0	14
Dark Green Capucine	" 10	6	Good flavour, crisp and fairly tender	0	10
Iceberg	" 12	11	Very good flavour, very crisp and tender	1	4
Cos Trianon	" 14	7	Heart sweet and tender, but outside rather tough	1	6
Favourite	" 16	10	Very good flavour, extra crisp and tender	0	14

Rousseau Blond Winter and Red Edged Victoria are supposed to have some merit on account of earliness, but they are very unsatisfactory, as their season is short and their quality poor. Among the best are Iceberg, All Heart, Favourite, Giant Crystal Head and Denver Market.

MELONS.

One variety of musk melon or cantaloupe and one of water melon were grown this year; both produced ripe fruit.

ONIONS.

Sixteen varieties of onions were tested this year. The following results were obtained:—

Variety.	Colour.	Shape.	Uniformity	Size.	Yield from 30-foot row.
					Lb.
Extra Early Red	Red	Flat	Good	Large	33
Baker Red Globe	Red	Globular	Good	Large	30
Johnson Dark Red Beauty	Red	Flat	Good	Medium	29½
Large Red Wethersfield	Red	Flat	Good	Large	29
Baker White Globe	White	Globular	Good	Large	27½
Baker Yellow Globe	Yellow	Globular	Good	Medium	26½
Red Early Flat	Red	Flat	Good	Medium	26
Ailsa Craig	White	Globular	(Not true	to type).	25
Salzer Great Red Wethersfield	Red	Flat	Good	Medium	24½
Danvers Yellow Globe	Yellow	Globular	Good	Medium	21
Australian Brown	Brown	Globular	Medium	Small	21
McKenzie Northland	Red	Globular	Poor	Small	20
Carter White Globe	White	Globular	(Not true	to type.)	19
White Queen (Pickling)	White	Flat			15
White Pearl (Pickling)	White	Flat			13
Early Barletta (Pickling)	White	Flat			11½

BRANDON.

PARSNIPS.

Two varieties of parsnips were grown this year: Improved Hollow Crown and Intermediate. Best results were obtained from the Hollow Crown; the Intermediate, which gave such desirable short roots last year was not true to type this year and produced ordinary long roots.

PEAS.

Twenty varieties of garden peas were tested out this year. The results were as follows:—

Variety.	Ready for Use.	Length of Vine.	Length of Pod.	Average No. of Peas in Pod.	Table Quality.	Yield from 30 foot row.	
		Inches.	Inches.			lb.	oz.
Early Pilot	June 25	24	3	6	Very good	2	0
Gregory Surprise	" 30	18	3	6	Very good	3	0
Thos. Laxton	July 3	36	$3\frac{1}{2}$	7	Good	3	0
American Wonder	" 4	27	$2\frac{1}{2}$	5	Good	2	0
Gradus	" 4	42	4	8	Good	3	0
Premium Gem	" 6	21	3	5	Very good	2	0
Early Giant	" 8	48	4	8	Good	3	0
Sutton Excelsior	" 11	29	$3\frac{1}{2}$	6	Very Good	3	8
McLean Advancer	" 11	27	3	6	Very Good	3	0
Western Beauty	" 11	38	3	8	Fairly good	3	0
Rivenhall Wonder	" 15	26	$3\frac{1}{2}$	6	Very good	3	8
Dainty Duchess	" 16	60	$4\frac{1}{2}$	8	Excellent	4	0
Rent Payer	" 17	32	4	7	Very good	5	0
Stratagem	" 17	30	4	7	Very good	3	8
Heroine	" 17	36	4	7	Very good	3	0
Telephone	" 17	57	$4\frac{1}{2}$	9	Excellent	3	0
Juno	" 17	32	3	6	Very good	3	0
Quite Content	" 20	72	$4\frac{1}{2}$	9	Fair	4	0
Late Giant	" 21	40	$4\frac{1}{2}$	7	Very good	6	8

Early Pilot was the earliest pea under test, with Gregory Surprise second. Late Giant and Rent Payer gave the greatest yield and were very good in quality at the same time. Others of outstanding quality and good yield are: Dainty Duchess, Telephone, Sutton Excelsior and Stratagem.

RADISH.

Four varieties of radish were grown. They were all ready for use on June 6, and little difference in quality could be observed.

SALSIFY.

One variety of spinach, Improved Thick-leaved, was grown; it was ready for use on June 10th.

SQUASH, MARROW, PUMPKIN.

Seven varieties of squash, four of marrows and three of pumpkins were sown. Germination was poor and the results consequently unreliable. The Hubbard is decidedly the best squash or marrow, on account of its fine flavour and good keeping quality. Some fine specimens of pumpkins were produced this year.

BRANDON.

TOMATOES.

Nine varieties of tomatoes were grown this year. The season was unusually favourable for the production of ripe tomatoes, and very good results were obtained. The seed was sown in the hotbed on April 4, the plants were set out on June 9. The results were as follows:—

Variety.	Ready for Use.	Yield from Five Plants.					
		Ripe.		Green.		Total.	
		Lb.	oz.	Lb.	oz.	Lb.	oz.
Florida Special	Aug. 6	29	13	15	0	44	13
Alacrity No. 14	July 25	27	6	8	0	35	6
Rennie XXX	July 25	23	7	11	0	34	7
Chalk Early Jewel	Aug. 6	21	15	16	0	37	15
Extremely Early IXL	July 30	21	13	16	14	38	11
Earliana (Northern Adirondack)	July 30	20	3	15	8	35	11
Earliana (Sunnybrook)	July 30	18	3	13	8	31	11
Johnson Jack Rose	July 30	[illegible]	14	20	0	36	14
Prosperity	Aug. 4	16	10	21	0	37	10

Although Florida Special has done best this year it is not recommended, as its success was due to the excessive heat. In normal or cool seasons, best results can be obtained from the various strains of Earliana.

TURNIPS.

Two varieties of white turnips and one of swede were tested this year. The white turnips are not worth growing in Manitoba as they are scarcely ever fit to eat. The swedes did quite well considering the season.

ORNAMENTAL PLANTS.

TREES AND SHRUBS.

No additions have been made to the arboretum this year, but the usual notes have been taken on the growth, hardiness, date of blooming, etc. Trees and shrubs bore the drought well, looked well all the season, and those that bloom were not deterred from making their usual display. Last year's report contained a description of the best shrubs and hedges for Manitoba use, which need not be repeated here.

ROSES.

The rose bed was well protected during the winter, by means of a covering of straw and earth. The bloom was fairly good considering the unfavourable season. Some of the most satisfactory varieties in use are: Paul Neyron, Magna Charta, Frau Karl Druschki, Mrs. Anthony Waterer.

HERBACEOUS PERENNIALS.

The hardy perennial is the most reliable and satisfactory plant for the growing of flowers around the Western farm home. Once established it produces flowers year

after year with very little trouble or care. This year the perennials stood the drought much better than the annuals and gave a succession of bloom from the last of May until the freeze up.

A new perennial border was set out last year. Most of the plants wintered satisfactorily and some bloom was produced this year. The old perennial beds made a fine show of bloom all season. Some of the best perennials for Manitoba use are: Siberian Iris, German Iris, Columbine, Paeony, Bleeding Heart, Sweet William, Perennial Phlox, Larkspur, Bellflower, Chinese Bellflower, Golden Glow, Orange Globe Flower, Giant Autumn Daisy.

BULBS.

Daffodils, hyacinths, freesias and tulips were used for house bloom in the winter. They were potted in the fall and provided a supply of beautiful flowers from Christmas until spring.

A large number of tulips were used for early spring bloom in the garden and made a splendid display. Some of the best varieties of tulips are: Red, Proserpine, Vermilion Brilliant, Imperator Rubrorum and Artus; White, Joost von Vondel and La Reine; Yellow, Couronne d'Or and Chrysolora; red and yellow, Keizerskroon and Duchesse de Parma. These are all perfectly hardy and well suited to the climate. No other bulb but the tulip is sufficiently hardy for satisfactory outdoor wintering for early spring bloom.

Gladioli and dahlias were planted in the spring for summer bloom, but did not do well this year. In normal seasons an excellent display can be obtained from these and in favourable seasons from cannas as well.

BRANDON.

ANNUALS.

The season has been the most unfavourable for annual flowers for many years. Continuous hot dry weather combined with a lack of water for artificial watering made it very difficult to keep up any appearance of bloom. Two hundred and three varieties and types of annual flowers were tested. All plants started in the hotbed were set out in permanent location about the first week of June. Some of the notes taken are as follows:—

Kind.	Where Sown.	Date Sown.	Flowering Period.	Remarks.
Asters (21 varieties)	Hotbed...	April 6..	July 27 to Oct. 13..	Suffered rather badly from blight.
Alonsoa Warscewiczii	" ..	" 8..	Aug. 3 to Aug. 22..	Very little bloom.
Alyssum, Sweet	Outside...	May 8..	July 11 to Oct. 13..	Stood drought well.
Amaranthus, Tricolor	Hotbed...	April 8..	......	Foliage plant.
Antirrhinum (17 varieties)	" ..	" 6..	Aug. 3 to Oct. 13..	Very desirable flowers.
Balsam, Mixed	" ..	" 8..	June 17 to July 27..	Suffered badly from drought.
Bartonia, Aurea	" ..	" 8..	......	No bloom.
Candytuft, mixed	" ..	" 8..	June 12 to Oct. 13..	Very hardy.
Carnation (2 varieties)	" ..	" 7..	Aug. 2 to Oct. 13..	
Castor Oil Plant, Bronze King.	" ..	" 6..	......	Foliage only, leaves three feet long.
Centranthus Macrosiphon	" ..	" 8..	July 6 to July 21..	Not handsome.
Chrysanthemum, annual	" ..	" 6	June 18 to Aug. 27..	Sparse bloom.
Clarkia elegans	" ..	" 8.	June 15 to Aug. 23..	Very handsome for early bloom.
Cockscomb	" ..	" 6.	July 24 to Oct. 13..	
Coreopsis (6 varieties)	" ..	" 8..	July 6 to Oct. 13..	Stood drought well.
Cosmea or Cosmos	" ..	" 8..	July 8 to Oct. 13..	Very handsome.
Daisy, Double Mixed	" ..	" 7.	June 20 to Aug. 12..	
Dianthus Heddewigii	" ..	" 8	July 4 to Oct. 13..	Very free bloomer.
Dimorphotheca Aurantiaca	" ..	" 8.	July 4 to Oct. 13..	
Godetia (6 varieties)	Hotbed...	April 8..	July 2 to Aug. 27..	Suffered severely in drought.
Everlasting Flowers (6 varieties)	" ..	" 7..	June 20 to Oct. 13..	Stiff and unsightly.
Jacobaea (Double Mixed)	" ..	" 8..	Aug. 1 to Aug. 27..	
Kochia Trichophylla	" ..	" 8.	......	
Larkspur, Annual (3 varieties).	" ..	" 8..	July 10 to Oct. 13..	Very satisfactory.
Linum Grandiflorum	" ..	" 8	July 6 to Oct. 13..	
Lobelia, tall (2 varieties)	" ..	" 6..	July 6 to July 31..	Did not do well.
Marigold, Double French Mixed	" ..	" 8..	June 17 to Oct. 13..	
Mignonette, Sweet Scented	" ..	" 6..	July 1 to Aug. 20..	
Nasturtium (8 varieties)	Outside...	......	July 27 to Oct. 13..	
Nemesia (4 varieties)	Hotbed...	" 7..	June 15 to Oct. 13..	Suffered severely in drought.
Nicotiana affinis	" ..	" 8..	......	Did not bloom.
Pansy (9 varieties)	" ..	" 4..	June 13 to Oct. 13..	Suffered from drought.
Petunia (4 varieties)	" ..	" 6..	June 15 to Oct. 13..	Very vigorous and hardy.
Phlox Drummondii	" ..	" 7.	June 21 to Aug. 8..	Suffered from drought.
Pyrethrum, Golden Feather	" ..	" 8..	......	Border plant.
Portulaca, Improved Double Mixed	" ..	" 8..	July 6 to Oct. 13..	
Rudbeckia, Golden Sunset	" ..	" 8	July 6 to Sept. 16..	
Salpiglossis, Large Mixed	" ..	" 8..	July 11 to Oct. 13..	Fine bloom.
Salvia (2 varieties)	" ..	" 6..	......	Did not bloom.
Scabious or Scabiosa	" ..	" 7..	......	Did not bloom.
Schizanthus	" ..	" 8..	June 17 to Oct. 13..	Made excellent showing.
Stocks (7 varieties)	" ..	" 6..	June 22 to Oct. 13..	Not as fine as usual, on account of drought.
Swan River Daisy or Bracychome	" ..	" 7.	June 20 to Oct. 13..	
Sweet Pea (64 varieties)	Outside...	" 25	July 7 to Oct. 13	Not so good a showing as usual
Sweet Sultan (3 varieties)	Hotbed...	" 8	July 8 to Oct. 13..	Stood drought well; splendid cutting.
Verbena (2 varieties)	" ..	" 8	June 18 to Oct. 13	Stood drought well.
Viscaria	" ..	" 8.	July 4 to Aug. 3 ..	Very pretty.

BRANDON.

Silvia Apple Tree, Brandon Experimental Farm.

Native plum tree in bloom, third spring after being set out.
Lethbridge Experimental Station.

Tulips. Lethbridge Experimental Station.

PLATE LIX

Hedge of *Deutzia gr cilis*, Early May Blossoms, Experimental Farm, Agassiz, B.C.

Fort Vermilion, Alta. Corn and Beans.

Fort Vermilion, Alta. Cabbage and Cauliflower.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, T. J. HARRISON, B.S.A.

SEASONAL CONDITIONS.

On the Indian Head Farm the season of 1914 was the most unfavourable from a horticultural standpoint that has occurred for several years. While the moisture in the soil from the previous fall and early spring rains caused a fairly good germination of flower and vegetable seeds, the dry weather, accompanied by a hot southwest wind which prevailed from the 9th of May until the 18th of June, killed many of the young plants. The unusual number and kinds of insect pests also caused considerable damage to the trees on the avenue, the flowers, and the vegetable gardens. On August 9 the temperature dropped to three degrees below freezing, causing a complete loss of all the more tender vegetables and flowers.

VEGETABLES.

The vegetable garden gave promise in the spring of being very successful, but the dry weather, cut worms, and finally the frost, so damaged it that both the quality and quantity were inferior to previous years.

Asparagus.—The old bed of asparagus in which were Barr Mammoth, Barr Elmira and Conover Colossal varieties, again produced an early crop of tender sprouts. These beds received very little attention other than the removal of the tops and mulching lightly with rotted manure in the fall. It would seem that this is a vegetable that should receive more attention in the vegetable gardens in Saskatchewan since it is the first to produce in the spring and requires very little attention once it has been established. Three new beds of Palmetto, Columbia Mammoth and Colossal were planted in 1913, but have not yet started bearing.

Beans.—The beans were planted in drills in the garden on May 18, and were cultivated with the horse cultivator and hoe to keep down the weeds and form a mulch between the rows. The table below gives the varieties under test with the date they were in use:—

Variety.	In Use.	Ripe.	Remarks.
Stringless Green Pod	July 30	Sept. 2	Fair crop.
Bountiful Green Bush	" 24	Aug. 30	Good crop.
Grennell Rustless Wax	" 22	" 28	Good crop.
Refugee or 1,000 to 1	Aug. 3		Did not ripen.
Golden Wax Keeney Rustless	July 24	Aug. 30	Light crop.
Valentine Wax	" 22	" 30	Medium crop.
Wardwell Kidney Wax	" 22	Sept. 2	Large crop.
Extra Early Valentine	Aug. 4	" 9	Medium crop.
Extra Early Refugee	July 30	Aug. 30	Extra good.

Beets.—The beets were planted on May 18, in drills about 16 inches apart. As they were not affected to any extent by the cut worms or frost they produced a fairly good crop. Nine different varieties were tested with the following results:—

Variety.	In Use.	Yield.		Remarks.
		Bush.	Lb.	
Eclipse	July 27	638	00	Extra good crop.
Early Blood Red Turnip	" 25	618	40	Good crop.
New Meteor	" 27	609	00	"
Ruby Dulcet	" 30	580	00	"
Cardinal Globe	" 30	493	00	Medium crop.
Danish Blood Turnip	" 30	483	20	"
Egyptian Dark Red Flat	" 25	444	40	"
New Early Black Red Ball	" 30	425	20	"
Early Flat	" 25	377	00	Light crop.

Brussels Sprouts.—Brussels sprouts are not grown in many gardens in the province, but on the Experimental Farm have always given good success. This season they were planted in the hot-house on March 28 and transplanted to the garden on June 1. A fair crop was obtained, the average weight of one dozen heads being forty pounds.

Celery.—Celery is a crop that is receiving more attention each year. The fact that it can be stored in the winter and come on the table with much of the freshness of a green vegetable makes it very desirable in the West. Last season it was sown in the hothouse on March 24 and transplanted on June 15. The different varieties were planted in trenches made as follows: The trench was dug 18 inches deep and 12 inches wide, in the bottom of the trench 6 inches of well rotted manure was placed. On the top of the manure 6 inches of the top soil was tramped in solid and the celery planted in this soil. On account of the dry season it was found necessary to water twice a week. The yield was fair and the quality good. The following varieties are among those recommended:—

Variety.	In Use.	Weight per dozen Heads.
		Lb.
Giant Pascal	Oct. 6	18
Evans Triumph	Sept. 15	12
Noil Magnificent	Oct. 7	12
Paris Golden Yellow	Sept. 28	11
French Success	" 20	11
Improved White Plume	Aug. 20	9
White Plume	" 20	8

A test was also made of several rows planted on the level, but neither the quality nor yield was equal to those planted in the trenches.

INDIAN HEAD.

Garden Corn.—Twelve varieties of garden corn were planted on May 18. They all matured sufficiently for table use, the Squaw sorts, however, were the only ones that matured sufficiently for seed.

Variety.	In Tassel.	Ready for Use.	Remarks.
Early Iowa	July 28	Aug. 17	Fair sized cobs.
Pocahontas Sweet	" 30	" 24	"
Metropolitan	Aug. 1	" 19	"
Early Dawn	July 20	" 17	Small cobs.
Perkins Extra Early Market	Aug. 1	" 24	"
Extra Early Adams	July 28	" 20	Good cobs.
Golden Bantam	" 30	" 20	Medium cobs.
Early Fordhook	" 28	" 17	"
Early Malcolm	" 20	" 24	"
Malakoff	" 27	" 21	"
Red Squaw	" 10	" 4	Small cobs.
White Squaw	" 10	" 4	"

Citrons.—The seed was planted in the hot-house on March 28, and transplanted into the garden on May 29. Very little fruit had set by August 9 when the frost destroyed all the vines.

Cabbage.—Eighteen varieties were sown in the hothouse on the 28th of March, and transplanted to the garden on May 29. These all made a good growth the early part of the season. Later in the season the cabbage butterfly did considerable damage. If the plants had not been treated, a complete failure would have resulted. The most effective method of treating was found to be Paris green. It was applied in a mixture of 4 ounces of Paris green to 40 gallons of water.

Variety.	In Use.	Average weight per head.	Remarks.
		lb.	
Fottler Improved Brunswick	Aug. 14	$6\frac{1}{2}$	Good heads.
Flat Swedish	" 28	$6\frac{1}{2}$	"
Improved Amager Danish Roundhead	" 14	6	"
Winningstadt	" 4	6	"
Danish Summer Ballhead	" 14	$5\frac{3}{4}$	"
Extra Amager Danish Roundhead	" 30	5	"
Copenhagen Market	" 4	5	"
Magdeburg	" 28	$4\frac{1}{2}$	Medium heads.
Lubeck	" 28	$4\frac{1}{2}$	"
German Nofalt	" 4	$4\frac{1}{2}$	"
Danish Stonehead (Red)	" 31	4	Good heads.
Danish Delicatesse (Red)	" 31	$3\frac{3}{4}$	Fair heads.
Early Jersey Wakefield	July 25	$3\frac{1}{2}$	Medium heads.
Late Flat Drumhead	Aug. 28	$3\frac{1}{2}$	"
Extra Early Midsummer Savoy	July 30	3	Small heads
Erfurt Small	" 25	3	"
Ellam Early Dwarf	" 27	3	"
Paris Market Very Early	" 25	3	"

Cauliflower.—Four varieties were planted in the hothouse on March 28 and transplanted to the garden on May 29. As with the cabbage, the butterfly gave considerable trouble and was only kept in check by the continual application of Paris green, applied after the heads had been tied up. If used in this way, very little, if any, of the solution reaches the head itself.

Variety.	Average per head. weight.	Remarks.
	lb.	
Early Snowball	$2\frac{3}{4}$	Medium heads.
Extra Early Erfurt, Dwarf	$2\frac{1}{2}$	Small heads.
Danish Giant	$2\frac{1}{4}$	"
Veitch Autumn Giant	....	Heads useless.

Carrots.—Two varieties of garden carrots were planted on May 2. The seed germinated well, but early in June the plants were attacked by cutworms, which destroyed about fifty per cent of the crop. The whole crop would have been destroyed if their ravages had not been checked by the application of bran and Paris green. This is prepared by mixing one pound of Paris green to forty pounds of bran and moistening slightly with water sweetened with sugar or molasses. This is scattered along the rows in the evening before the worms come out to feed. They eat the bran instead of the plant and in this way two or three applications will exterminate the pest. The two varieties of carrots gave the following result:—

Variety.	In Use.	Dug.	Yield.	
			Bush.	lb.
Improved Nantes	July 30	Oct. 6	348	..
Long Chantenay	Aug. 4	" 6	270	40

Cucumbers.—Five varieties were planted in the hothouse on March 29 and transplanted to the garden after the danger of frost was past. A heavy crop of fruit set on all varieties, but was destroyed by frost before any had been gathered. Those that showed the heaviest crop were Giant Pera, Prize Pickling and Extra Early Russian.

Lettuce.—There were ten varieties under test. Two sowings were made of each variety, the first on May 2, and the second on June 20. Due to the dry weather the crop from the first seeding was not up to the average, while the second seeding was almost a complete failure. The result of the first seeding is given below:—

Variety.	Ready for Use.	Remarks.
Red Edged Victoria	June 20	Poor crop.
Unrivalled Summer	" 20	Fair crop.
Rousseau Blond Winter	" 18	Poor crop.
Dark Green Capucine	" 24	"
Giant Crystal Head	" 20	Good crop.
Grand Rapids	" 25	Fair crop.
Hanson Improved	" 24	"
Simpson Black Seeded	" 18	Medium crop.
Iceberg	" 20	Good crop.
Dreer All Heart	" 22	Poor crop.

INDIAN HEAD.

Musk Melon.—One variety, Salzer Earliest Ripe, was started in the hothouse on March 24 and transplanted to the garden on May 29. Considerable difficulty was experienced in getting the fruit to set. Eventually a number of good melons were obtained and by protecting them at night were ripened and proved to be of excellent flavour.

Onions.—Thirteen varieties were sown in the garden on April 18. The seed germinated well, but the young plants were attacked by the cutworm and onion maggot to such an extent that a report on the yields of the experiment would be worthless.

Garden Peas.—Sixteen varieties were under test. The seed was sown in the garden on May 2, and fair yields were obtained, although cutworms attacked the young plants and thinned them out considerably before the application of poisoned bran. The table below will give the date on which the different varieties were ready for use and ripe:—

Variety.	Ready for Use.	Ripe.
Dainty Duchess	July 25	Aug. 17.
Gradus	" 7	" 16.
Sutton Excelsior	" 20	" 10.
McLean Advancer	" 8	" 14.
Gregory Surprise	June 30	" 10.
American Wonder	July 4	" 10.
Premium Gem	June 30	" 14.
Heroine	July 20	" 17.
Lincoln	" 20	" 14.
Juno	" 25	" 17.
Stratagem	" 27	" 10.
Thos. Laxton	" 4	" 16.
Telephone	" 23	" 17.
Early Giant	" 4	" 20.
Quite Content	" 4	" 25.

Parsley.—One variety, Double Curled, was sown in the garden on May 2. It was ready for use on August 20, and gave an excellent yield.

Parsnips.—Two varieties were under test. The seed was sown in the garden on May 2, and the roots were ready for use October 10. Intermediate is much shorter than Hollow-Crown and is, therefore, much easier to dig. It also gave a heavier yield as will be noted from the table below:—

Variety.	Dug.	Yield.	
		Bush.	lb.
Intermediate	Oct. 6	232	0
Improved Hollow-Crown	" 6	193	20

Potatoes.—Twenty-three varieties were under test this year, but owing to the extremely dry season the yields were very disappointing. A number of interesting experiments were started, such as, the number of eyes per seed; different depths of planting; distance apart in the row; imported *versus* home-grown seed and seed selection. Although some interesting results were obtained it is not deemed advisable to use the data in this report, as the season was so abnormal the results might be misleading. The following table will give the yields of the different varieties which were planted in clay loam on May 26 and dug on September 28.

INDIAN HEAD.

Potatoes 1914.

No.	Variety.	Growth.	Size.	Form.	Colour.	Yield per Acre.	
						Bush.	Lb.
1	Irish Cobbler	Medium	Medium	Round	White	210	15
2	Eureka Extra Early	Strong	Large	Oval	"	198	10
3	Wee MacGregor	Medium	"	"	"	164	20
4	Vick Extra Early	Strong	"	Long	Pink	159	30
5	Early Hebron	"	"	Round	"	149	50
6	Whiting Beauty	Medium	Medium	Oval	White	135	20
7	Gold Coin	Strong	"	"	"	130	30
8	Early Norther	Medium	"	"	Pink	130	30
9	Early Ohio	"	"	Round	"	125	40
10	Late Puritan	"	Small	"	White	125	40
11	Bermuda Early	"	Medium	"	Red	120	50
12	Carman No. 1	"	"	Oval	White	116	00
13	Dreer Standard	Strong	"	Round	"	116	00
14	Everett	Medium	Small	Oval	Pink	113	35
15	Houlton Rose	Strong	Medium	Round	"	111	10
16	Manitoba Wonder	Medium	"	"	"	106	20
17	Empire State	"	"	Oval	White	101	30
18	Table Talk	Strong	Small	Round	"	101	30
19	Dalmeny Beauty	Medium	Medium	"	"	99	05
20	Rawlings Kidney	"	Small	"	"	91	50
21	Morgan Seedling	"	"	Oval	"	87	00
22	New Queen	"	"	Round	Pink	82	10
23	Money Maker	"	"	Long	White	72	30

Radish.—Two varieties, Forcing Turnip Scarlet, and Early Scarlet White Tipped, were under test. Three plantings were made, the first on May 2, the next on June 20, and the last on July 2. Both varieties gave a large yield and good quality from the first seedings; the second seeding was only fair, while that sown on July 2 was almost a failure.

Squash.—Ten varieties were under test and gave promise of a fair crop until August 9, when all were destroyed by frost.

Salsifiy.—One variety, Long White, was sown in the garden on May 18. This made a good growth of top, but the roots were so fibrous that they were useless for cooking purposes.

Tomatoes.—Sixteen varieties were planted in the hot-house on March 24 and transplanted into the garden on June 3. A heavy crop of fruit set on most varieties, but all were destroyed by frost on August 9. One plant of each variety was trimmed back to two stalks to see what effect close trimming would have on the quantity and earliness of the fruit. At the date they were killed by the frost it would appear that the crop was heavier, more uniform and considerably farther advanced than on the untrimmed vines. Among the different varieties Alacrity No. 14, a variety received from the Central Experimental Farm, gave promise of an exceedingly heavy crop. This is also the earliest maturing variety under test.

Table Turnips.—Three varieties were sown in the garden on May 2 and pulled on October 7. Favourite gave a heavy crop of medium sized roots of fine quality and was much superior to the other sorts.

Variety.	Yield.	
	Bush.	Lbs.
Favourite	966	40
Extra Early White Milan	715	20
Early Flat Strap Leaved	580	

ANNUAL FLOWERS.

Owing to the dry season the annual flowers were not up to the average in either quantity or quality of bloom. The varieties which made the best showing were sweet peas, stocks, verbenas and Petunias. The asters were badly affected with rust and consequently did not give nearly as profuse a bloom as last season. The table below will give a number of the varieties under test this season.

Variety.	Transplanted to garden.	In bloom.	Remarks.
Antirrhinum (6 varieties)	June 10	July 27 to Oct. 10	Fair show of bloom.
Antirrhinum (7 ")	" 10	" 7 to Aug. 26	" "
Antirrhinum (5 ")	" 10	" 20 to " 26	" "
Asters (8 varieties)	" 3	" 27 to Sept. 15	Badly rusted.
Ageratum, Improved Dwarf	" 12	" 20 to " 10	Good show.
Amaranthus	" 11	" 24 to Aug. 9	Frozen off.
Asters (13 varieties)	" 4	" 3 to Sept. 15	Affected by rust.
Alonsoa	" 11	" 28 to " 10	Fair amount of bloom.
Alyssum (sweet)	" 6	" 4 to Oct. 14	" "
Amaranthus	" 5		Frozen off Aug. 9.
Balsam (mixed)	" 11		" "
Bartonia aurea	" 5	July 20 to Sept. 17	Good amount of bloom.
Candytuft (mixed)	" 6	" 27 to Oct. 10	" "
Carnation (Marguerite)			Did not germinate.
Castor Oil Plant	June 6		Fine foliage, no bloom.
Centranthus	" 6	Aug. 11 to Sept. 10	Fair amount of bloom.
Chrysanthemum (mixed)	" 5	June 19 to " 9	Good show of bloom.
Clarkia elegans (mixed)	" 6	July 28 to Oct. 10	Fair show of bloom.
Cockscomb (mixed)	" 5	June 20 to Aug. 9	Frozen off.
Cosmos	" 4	" 18 to " 9	" Aug. 9.
Cosmos (I. Head seed)	" 4	" 17 to " 9	" "
Convolvulus (major, double)	" 11	July 7 to " 9	" "
Daisy (double)	" 5	" 26 to Oct. 20	Fair amount of bloom.
Dianthus Heddewiggii	" 13	Aug. 4 to " 15	" "
Dimorphotheca (Hybrid)	" 4	June 18 to Sept. 10	Good show of bloom.
Dimorphotheca (I. Head seed)	" 4	" 18 to " 10	Good.
Eschscholtzia	" 6	July 27 to Oct. 10	Good show.
Evening Primrose	" 12		Did not bloom.
Godetia (6 varieties)	" 6	Aug. 9 to " 20	Good show.
Gladioli (12 varieties)	" 5	July 3 to Sep. 17	Very fine show.
Helichrysum (6 varieties)	July 15	Oct. 20	
Helichrysum (I. Head seed)	June 6		Killed off.
Larkspur (Rosy Scarlet)	" 5	July 4 to Oct. 21	Fine show of bloom.
Larkspur (blue)	" 5	" 15 to " 24	" "
Larkspur (white)	" 5	" 15 to " 16	" "
Lavatera rosea splendens (Mallow)	" 6	Aug. 11 to Oct. 14	Good show of bloom.
Leptosiphon (Hybrids)	" 6	" 11 to Sep. 10	Fair show of bloom.

INDIAN HEAD.

ANNUAL FLOWERS—*Concluded.*

Variety.	Transplanted to garden.	In bloom.	Remarks.
Linum grandiflorum	June 6	July 20 to Oct. 20	Fine bloom.
Lobelia (Ramosa Blue)	" 12	" 30 to Aug. 9	Frozen off
Lupinus (mixed)	" 6	Aug. 9 to Sept. 14	Fair show of bloom.
Lupine (I. Head seed)	" 6		Plants weak did not germinate.
Marigold (Double French)	" 4	June 19 to Sept. 4	Fair bloom.
Mignonette	" 6	July 28 to Oct. 22	Good show.
Nasturtium (9 varieties)	" 10	" 4 to " 4	Good show.
Nemesia (5 varieties)	" 10	" 4 to Aug. 9	Frozen off.
Nicotiana (Hybrids)	" 5	June 24 to Oct. 15	Fine show.
Pansy (8 varieties)	" 10	" 28 to " 27	Good show.
Petunias (4 varieties)	" 4	July 4 to Sept. 22	" "
Phlox Drummondii (9 varieties)	" 10	June 18 to Oct. 22	Very fine.
Poppy (Double Paeony flowered)	" 5	July 28 to Sept. 4	Fair show.
Poppy (Shirley)	" 5	" 28 to " 10	" "
Rudbeckia	" 5	" 7 to Oct. 29	" "
Scabious (Large flowered mixed)	" 5	" 27 to " 17	Good show.
Schizanthus (Hybrids)	" 6	June 24 to Sept. 17	Very good.
Stocks (6 varieties)	" 6	" 19 to " 10	Good show.
Swan River Daisy	" 6	" 19 to " 14	Fair show.
Sweet Sultan (mixed)	" 6	July 11 to Oct. 8	" "
Sweet Sultan (I. Head seed)	" 6	" 7 to " 8	Very good.
Stocks (Large flowering white)	" 4	" 4 to Sept. 10	Good show.
Sweet Peas (Spencer Seedling)	April 6	" 10 to Oct. 22	Fine show.
Verbena (Mixture)	June 4	" 4 to " 10	" "
Viscaria cardinalis	" 6	" 7 to Sept. 10	Fair show.
Virginian Stocks (I. Head seed)	" 12	" 27 to Aug. 26	Good show.

INDIAN HEAD.

PERENNIALS.

On the average farm in southern Saskatchewan more attention should be given to the perennial flowers as they do not require the attention that is given to the annuals, and give a magnificent bloom. For this reason considerably more space is being given to these each year on the Indian Head Farm. In 1912 a border twelve feet wide and four hundred and twenty feet long was laid out and planted with hardy sorts. This season an addition of over one hundred feet was made to this. Owing to the dry season the quantity and quality of the bloom was not up to the average, but was, nevertheless, well worth the trouble that had been taken in mulching and cultivating the border. Below is a table showing the varieties that bloomed this season:—

Variety.	In bloom.	Remarks.
Aquilgeia (Rose Queen)	June 19 to Aug. 12	Fair show of bloom.
Aconitum (Monk's Hood)	July 23 to Sept. 2	Good " "
Clematis recta	" 1 to July 18	Fair " "
Campanula	" 12 to Aug. 25	" " "
Comfrey	June 3 to July 28	Good " "
Dianthus	" 25 to " 31	" " "
Delphinium	July 13 to Aug. 16	" "
Dianthus	June 25 to Sept. 25	" " "
Dielytra (Bleeding Heart)	" 2 to July 18	Fair " "
Dictamnus (Gas Plant)	" 22 to " 4	" " "
German Iris	May 30 to June 8	Good " "
Gypsophila (Chalk Plant)	Aug. 4 to Sept. 4	Fair " "
Hemerocallis	July 10 to Aug. 2	Good " "
Helenium (Sneeze weed)	Sept. 8 to Oct. 2	Fair " "
Helianthus	July 7 to Sept. 17	Good " "
Lilium elegans	" 1 to Aug. 4	Fair " "
Lupinus	June 19 to July 28	" " "
Perennial Phlox	Sept. 1 to Sept. 20	Good " "
Paeonia	July 7 to Aug. 24	" " "
Platycodon	" 18 to " 20	Fair " "
Perpetual Carnation	Aug. 30 to Oct. 15	Good " "
Rudbeckia	" 11 to Sept. 10	Fair " "
Siberian Iris	June 10 to July 8	Good " "
Sweet William	" 20 to Aug. 15	" " "
Shasta Daisy	" 28 to " 21	" " "
Spiraea (Dropwort)	" 28 to July 28	Fair "
Scarlet Lychnis	" 30 to Aug. 26	Good " "
Thalictrum	" 25 to July 22	" " "
Trollius (Globe flower)	" 14 to " 20	" " "
Veronica (Iron weed)	" 15 to Aug. 26	Fair " "
Yarrow	" 20 to Sept. 10	" " "

BULBS.

Each fall several thousand bulbs of tulips, narcissus, and crocus are planted and give a magnificent show of bloom early in the spring. After the bloom is over the bulbs are taken up and annual flowers put in their place. By following this plan bloom may be obtained from the early spring to the late autumn.

TREES AND SHRUBS.

The past season was not a favourable one for trees and shrubs. The Manitoba maple was attacked, shortly after leafing out, with the larvae of the fall canker worm. On the avenue many of the trees were defoliated before their ravages were checked by the use of Paris green spray. In all six or seven miles of avenue were sprayed

for this insect. Later in the season the leaf roller did some damage but not extensively. The larch or tamarack was also attacked by the larvae of the larch saw fly, but as only a few specimen trees of this sort were growing in the arboretum, the insects were easily controlled by the use of Paris green spray. In an endeavour to straighten out some fields two wood lots that were planted in 1892 and 1895, totalling an acreage of 7½ acres, were cut out; in all 85 cords of wood were obtained. This was both Manitoba maple and green ash, which should make first-class firewood.

Flowering Shrubs.—The flowering shrubs came into bloom early but the dry weather caused the flowers to wither shortly after they were in bloom. Among the sorts recommended for the average farm are *Caragana arborescens, Caragana pygmœa,* lilac, spiraea, honeysuckle and a few of the hardy roses.

Ornamental Hedges.—There are thirty specimen hedges in the arboretum, which are kept closely trimmed during the growing season. Those that have proven most suitable to western conditions are: Siberian pea tree (*Caragana arborescens*), native choke cherry *(Prunus virginiana),* Manitoba maple *(Acer Negundo),* common lilac (*Syringa vulgaris*), Japanese lilac (*Syringa japonica*), blue spruce (*Picea pungens*), white spruce (*Picea alba*), and balsam fir (*Abies balsamea*). The last three are recommended where a high hedge is required.

BUSH FRUITS.

The plantation of small fruit bushes being only one year old, no fruit of any consequence was obtained this season. Most varieties made a satisfactory growth of well matured wood and went into the winter in splendid condition. Below is a list of those at present under test:—

Red Currants—
- Greenfield Red.
- Pomona.
- Perfection.
- Red Dutch.
- Red Grape.
- Red Cross.
- Rankin Red.
- Victoria Red.
- Wilder.

White Currants—
- White Grape.
- White Cherry.
- Large White.
- Verrieres White.
- White Imperial.

Black Currants—
- Boskoop Giant.
- Climax.
- Collins.
- Clipper.
- Eagle.
- Dominion.
- Eclipse.
- Magnus.
- Kerry.
- Saunders.

Black Currants—Con.
- Victoria Black.
- Topsy.

Gooseberries—
- Ruth.
- Downing.
- Ramsay.
- Smith Improved.
- Richland.
- Houghton.
- Red Jacket.
- Mabel.
- Rideau.
- Silvia.
- Carman.
- Pale Red.

Raspberries—
- Early King (red).
- Marlboro (red).
- Dr. Reider (red).
- Cuthbert (red).
- Sunbeam (red).
- Herbert (red).
- Golden Queen (yellow).
- Hilborn (Black Cap).

Blackberry—
- Snyder.

PLUMS.

In the plum orchard are a number of cross-bred varieties obtained from Professor N. E. Hansen of the South Dakota Agricultural College in 1908. There are a number which have produced a good preserving fruit and are proving sufficiently hardy to thrive in our climate. Among those and others that have produced good fruit are: Aitkin, Tapa, Wastesa, Hanska, Eyami, Inkpa, Yuteca, Winnipeg, Owanka and Assiniboine. The last named is an extra large plum, ripens early, and is of excellent flavour. This season some of the best varieties were budded on native seedling stock. Over 90 per cent of these buds "took." It now remains to be seen how they will come through the winter.

APPLES.

Up to the present a standard apple has not been matured at the Indian Head Farm. An endeavour is being made to originate or introduce varieties that will produce a good standard apple in this climate. Three methods are being tried out. The first is the planting of seedlings of standard varieties in nursery rows in order to get them acclimated. In 1912 about ten or twelve thousand seedlings were put out and last year eight thousand more were obtained from Ottawa. Almost every one has lived and made a good growth. It is now quite evident that this plan promises some success as none of those planted has shown any inclination to winter kill. Those set out in 1912 are now fine, strong trees and will be used next season to fill in the blanks in the different orchards, and it is hoped that from some of these we may obtain a tree that will produce a good, edible fruit. The second plan is to obtain standard apple trees two or three years old from a Western nursery and plant these in sheltered orchards. At present there are about two hundred trees that have come through the winter in good condition. These are mostly Russian varieties. The third method is an endeavour to produce an apple by crossing. As has been stated in former reports a number of Dr. Saunders' cross-bred varieties have proved a decided success on this farm. The fruit of these, however, is not very much superior to the ordinary crab apple produced in the east. A second cross with standard apple has been made. These trees have proven hardy, but have not yet started to fruit so that the quality cannot be reported on at this time. This season a large number of the first crossed apples produced a good crop of average sized fruit. The following is a list of a few of the better sorts and the weight of fruit obtained from each:—

Name.	Picked.	Weight of fruit.
		Lbs.
Jewel	Sept. 2	55
Seedling of Derby	Aug. 28	29
Columbia	Sept. 3	35½
Seedling of Madge	Aug. 28	28
Robin	" 28	15
Eve	" 28	26
Seedling of Jewel	" 28	31
Seedling of Bank	" 28	23
Lizzie	" 28	17
Seedling of Sparta	Sept. 2	26
Seedling of Tony	" 2	24
Pioneer	" 2	30
Tony	" 2	65
Ruby	" 2	23
Prince	Aug. 29	38½
Alberta	Sept. 2	25

Indian Head.

DISTRIBUTION OF SAMPLES.

Each spring a free distribution of samples of the products of the horticultural department is made to residents on farms in Southern Saskatchewan. These comprise tree and shrub seedlings, small fruit cuttings, tree and shrub seed, flower seeds, potatoes and rhubarb roots. Below is a list of those sent out during the past season:—

Trees.—Five hundred and sixty packages each containing seventy-five seedlings of Manitoba maple and green ash.

Shrubs.—452 packages each containing 50 assorted varieties made up principally of Caragana, Lilac and Honeysuckle.

Tree and shrub seed.—140 packages containing one pound of Manitoba maple, Green ash and caragana.

Flower Seed.—243 packages containing 4,680 packets of hardy annual and perennial seeds.

Potatoes. 2,648 samples of different varieties in three pound packages.

Rhubarb roots.—145 packages containing 6 roots of superior varieties.

EXPERIMENTAL STATION, ROSTHERN, SASK.

REPORT OF THE SUPERINTENDENT, WM. A. MUNRO, B.A., B.S.A.

Horticulture is now an attractive part of the work carried on at this Station. The hedges and shrubbery have developed sufficiently to show the plan of arrangement and also to afford considerable protection to the flowers and vegetables. The bush fruits are sufficiently established to demonstrate the possibilities of the yield of the different varieties under test.

There is also a response to horticultural development in almost every household, both in town and country, and more especially in those newer districts along the lines of railway east and west, and north of Prince Albert. A great deal of credit for the work in horticulture is due the gardener, Mr. William Godfrey, to whose interest in the work and painstaking efforts in the carrying out of experiments and in details relating to the care of the grounds, much of the success is due.

THE SEASON.

The season of 1914 opened rather slowly, alternate spells of cold and warm days occurring from the middle of March. Seeding began on April 23, and work continued under favourable conditions. Occasional showers kept the crops growing and in thriving condition until early in July, but from then on, those on sandy or ill-prepared land suffered.

The rainfall in July of this year was the lowest for the same month since records of this Station began.

Following is the precipitation record in inches for the past four growing seasons, from April 1 to August 15:—

Months.	1911.	1912.	1913.	1914.	Average for four years.
	Inches.	Inches.	Inches.	Inches.	Inches.
April	0·86	0·67	0·26	0·63	0·605
May	2·38	2·15	1·26	1·96	1·937
June	3·55	2·81	1·87	2·00	2·557
July	2·89	5·25	3·80	1·40	3·33
Aug. 1-15	0·43	0·23	2·24	0·13	0·76
Totals	10·11	11.11	9·43	6·12	9·17

VEGETABLES.

The dry season was favourable to the development of some vegetables, and detrimental to that of others.

The cabbage and corn were not up to the standard, and there were no cauliflowers matured until after the rains started towards the end of the season, although many heads started to form and then withered. The celery suffered most of all, and up to the time of the beginning of the rains in August was very poor. On the other hand,

the tomatoes did better this season than ever before at this Station. The inference is that tomatoes do better under dry conditions and that celery and cauliflowers would benefit by a liberal water supply throughout the growing season.

Tomatoes, celery, cauliflower, melons, and squash, gave better results by sowing seeds in pots and boxes in the house earlier than was safe to sow any seeds in the hotbed, and later placing the pots in the hotbed, than by sowing directly in the hotbed.

GARDEN BEANS.

These were sown on May 15 and were not picked when fit to use, but were allowed to ripen. The yields recorded are for ripe beans from a row thirty feet long.

Variety	Date of Blooming.	Fit for Use.	Weight off 30 foot row.	
			lb.	oz.
Bountiful Green Bush	July 6	July 20	3	0
Grenell Rustless Wax	" 6	" 18	2	10
Golden Wax, Keeney Rustless	" 13	" 26	2	9
Refugee or 1000 to 1	" 26	Aug. 4	2	4
Wardwell Kidney Wax	" 11	July 20	1	12
Extra Early Valentine	" 6	" 18	1	11
New White Stringless Green Pod	" 11	" 18	1	10
Extra Early Refugee	" 11	Aug. 1	1	8

BEETS.

Beets were sown on May 25 and thinned on June 25. Following is a table showing the varieties tested, and the weight of mature beets in a row 30 feet long:—

Variety.	Ready for use.	Weight in 30-ft. row.	
		Lb.	Oz.
Rennie Cardinal Globe	Aug. 6	75	14
Early Blood Red Turnip	Aug. 6	72	12
Ruby Dulcet	July 24	64	8
Egyptian Dark Red Flat	Aug. 6	63	10
Eclipse	July 24	59	4
New Meteor	Aug. 6	55	6
New Early Black Red Ball	Aug. 6	49	6

BRUSSELS SPROUTS.

Dwarf Improved was the only variety of Brussels Sprouts under test. It was sown in the hotbed on April 11 along with the cabbage and cauliflower, transplanted on May 27 and was ready for use August 9. Ten average heads weighed 46 pounds 12 ounces.

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CABBAGE.

Fifteen varieties of cabbage were under test. These were sown in the hotbed on April 11 and transplanted to the garden on May 26. The following table shows the date at which they were ready for use and the weight of ten average heads of each variety:—

Variety.	Ready for use.	Weight of ten average heads.	
		Lb.	Oz.
Flat Swedish	Aug. 28	120	11
Danish Summer Ballhead	" 21	85	2
Large Late Flat Drumhead	" 28	81	9
Improved Amager Danish Roundhead	Sept. 11	77	14
Copenhagen Market	Aug. 14	76	3
Fottler Improved Brunswick Shortstem	" 28	64	8
Extra Amager Danish Roundhead	Sept. 11	63	2
German Nofalt	Aug. 14	62	8
Magdeburg	Sept. 11	61	9
Lubeck	Aug. 28	61	4
Winningstadt	" 28	49	12
Extra Early Midsummer Savoy	" 14	43	15
Small Erfurt	" 14	43	7
Paris Market Very Early	July 28	41	5
Early Jersey Wakefield	Aug. 8	31	12

Cabbage received from R. Wiboltt, Denmark, too late to be sown with the other varieties was sown on May 16 and planted on June 24 with the following results:—

Variety.	Ready for use.	Weight of 30-ft. row	
		Lb.	Oz.
Round Express	Sept. 1	71	2
Copenhagen Market	" 8	69	9
True Danish Succession	Oct. 15	62	2
True Danish Winter Roundhead	" 15	45	2
Red Danish Stonehead	" 15	24	10

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CAULIFLOWER.

Three varieties of cauliflower were sown on two different dates, April 11 and May 16, respectively, and transplanted on May 27 and June 24th. Following is a list of varieties showing date ready for use and number of ripe heads in 60 foot row:—

Variety.	Ready for use.	Number of good heads in 60 foot row.
First Sowing.		
Danish Giant or Dryweather	July 31	41
Extra Selected Early Erfurt Dwarf	" 26	16
Early Snowball	" 26	7
Second Sowing.		
Danish Giant or Dryweather	Sept. 21	34
Extra Selected Early Erfurt Dwarf	" 21	27
Early Snowball	" 21	16

Three varieties of cauliflower were received from R. Wiboltt, Denmark, too late to be sown with the other varieties and were sown on May 16 and planted on June 24 with the following results:—

Variety.	Ready for use.	Number of ripe heads in 60 foot row.
Early Snowball	Sept. 16	47
Dwarf Erfurt	" 26	26
Danish Giant or Dryweather	Oct. 7	14

CUCUMBERS, CITRON, SQUASH AND MELONS.

The dry weather was favourable for the development of these plants, this being the first season we have been able to mature any of these fruits.

Cucumbers.—Five varieties of cucumbers were tried with the following results; these were sown in the hotbed on April 14, pricked out into the cold frame on April 30 and planted on June 3:—

Variety.	Number of fruits from one plant planted in the open.	Number of fruits from one plant planted in hot-bed after removal of cabbage, etc.
Extra Early Russian	30	
Prize Pickle	21	
Peerless or Improved White Spine	7	21
Giant Pera	6	65
Cool and Crisp	5	

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Citron.—One variety of citron, sown on April 14, pricked out on April 30 and planted on June 3, was ready for use from August 23 till September 15 and three plants yielded seven fruits weighing 15 pounds 5 ounces.

Muskmelon.—Three sowings were made of Salzer Earliest Ripe Muskmelon. First sowing was on April 5, potted on May 18, and planted in the open on June 3, formed fruit but none of them matured. Second sowing on May 6, planted in the hotbed on June 6 and kept under glass all summer yielded 21 fruits from ten plants. These weighed 33 pounds 10 ounces and were ready for use between August 19 and September 21. The third sowing on May 18, planted in the cold frame on June 20 and kept under glass all summer yielded 26 fruits from 18 plants. These weighed 40 pounds, 14 ounces.

One Pumpkin Connecticut Field, sown at the same time as the muskmelons and planted in the open did not form fruits but developed very rank vines.

CARROTS.

Two varieties of carrots from Vilmorin, Improved Nantes and Half Long Chantenay, were sown in the open on May 14 and were ready for use on August 6. The Nantes yielded 25 pounds 13 ounces from a 30 foot row and the Chantenay 31 pounds 10 ounces.

Three varieties of carrots from R. Wiboltt of Denmark, viz.: St. Valery Long Red, Improved Early Wanted, and Improved Scarlet Intermediate were sown on May 16 and ready for use on August 6. The yields from a 30 foot row were:—

St. Valery Long Red, 24 pounds 9 ounces.
Improved Early Wanted, 26 pounds 12 ounces.
Improved Scarlet Intermediate, 20 pounds 14 ounces.

TABLE CORN.

The dry weather was detrimental to the best development of the corn and Malakoff and Metropolitan Sweet did not become mature enough for table use. The corn was planted in hills on May 15 and the following table shows the relative earliness and yield of the five most promising varieties:—

Variety.	Ready for use.	Weight from 12 average hills.	
		Lb.	Oz.
Squaw (C.E.F.)	Aug. 28	8	4
Early Malcolm (C.E.F.)	Sept. 9	6	8
Early Dawn	" 8	6	2
Golden Bantam	" 22	3	4
Pocohontas Sweet	" 22	3	0

LETTUCE.

Ten varieties of lettuce were sown, both in the hotbed for early use, and in the open for later use. Iceberg is considered the best of those tested.

ONIONS.

Two sowings were made of each of thirteen varieties of onions, one in the hotbed on April 11 which was planted in the open on June 2, and one in the open on May 14. There did not seem to be any advantage gained, either in yield or earliness from sowing in the hotbed and transplanting to the open, over sowing directly in the open.

CELERY.

Some difficulty is often experienced in starting celery because the seed is small and slow to germinate.

One sowing in the hotbed on April 11 did not come to maturity and another sowing in pots in the house on March 30, pricked out into cold frame on May 22 and planted on June 22, gave very fair results.

Variety.	Ready for use.	Weight of 15 foot row.	
		Lb.	Oz.
Giant Pascal	Oct. 3	47	2
Evans Triumph	″ 3	39	2
Noll Magnificent	″ 3	38	6
French Success	″ 3	34	0
Improved White Plume	Sept. 26	26	4
Paris Golden Yellow	Oct. 3	20	8
White Plume	Sept. 26	16	15

Storing Celery.—Celery was kept fresh and crisp until May this year by packing it in moist earth in the cellar at time of digging. The plants were placed almost tight against one another.

TOMATOES.

The dry weather was favourable for the ripening of tomatoes. Ten varieties were grown under different conditions. One lot was sown in pots in the house on March 30, and the pots plunged into the hotbed when the hotbed was ready on April 30, transplanted to the open on June 1, and trimmed, and trained to a stake. The second and third lots were sown in the hotbed on April 11th, and planted in the open on June 6, the second lot then being trimmed and tied to a stake and the third lot left untrimmed and allowed to spread on the ground. Results are from one plant of each variety:—

Variety.	First Ripe Fruit.	No. of Ripe Fruits to Sept. 10.	Weight of Ripe Fruits.	Weight of Green Fruits to Sept. 10.	First Ripe Fruit.	No. of Ripe Fruits to Sept. 10.	Weight of Ripe Fruits.	Weight of Green Fruits on Sept. 10.	First Ripe Fruit.	No. of Ripe Fruits to Sept 10.	Weight of Ripe Fruits.	Weight of Green Fruits on Sept. 10.
	Started in pots and trained to stakes.				Started in hotbed and trained to stakes.				Started in hotbed and left to trail on ground.			
			Lb. oz.	Lb. oz.			Lb. oz.	Lb. oz.			Lb. oz	Lb. oz.
Alacrity	Aug. 6	67	15 3	19 6	Sept. 2	8	2 0	3 4	Sept. 10	1	0 5	5 1
Rennies XXX, Earliest Round	″ 6	73	15 1	24 2	Aug. 10	3	0 11	0 14	″ 10	4	0 14	7 0
Johnson Jack Rose	″ 10	49	9 14	21 6	Sept. 2	3	0 8	0 10	″ 10	....	......	8 13
Prosperity	″ 12	63	11 7	21 6	″ 2	5	1 4	3 14	....	.....	....	5 0
Extremely Early I.X.L.	″ 6	126	29 4	20 12	″ 2	5	1 2	4 2	Sept. 10	3	0 15	13 2
Earliana, Sunnybrook strain	″ 8	58	13 1	21 10	Aug. 8	5	1 7	2 8	......	.....	.....	88 1
Chalk Early Jewel	″ 12	77	20 13	23 13	Sept. 5	4	1 2	4 5	....	....	....	22 10
Florida Special	″ 8	75	15 5	31 11	Aug. 22	4	0 15	3 12	......	....	....	3 15
North Adirondack	″ 30	56	10 7	26 9	″ 29	9	1 8	2 1	Sept. 2	4	0 14	5 14
Bonny Best	″ 15	74	14 2	27 7	Sept. 10	4	1 0	5 6	....	...	......	7 9

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POTATOES.

The yield in potatoes this year was far short of any other at this Station since its establishment in 1909. There is also a change in some of the results of cultural methods from that of other years. This particularly applies to the depth of seeding and to the relative merits of hilled and level cultivation.

Following is a table showing the results of some of the leading varieties for the past four years, and the three and four year averages:—

Variety.	1911 Yield per acre.	1912 Yield per acre.	1913 Yield per acre.	1914 Yield per acre.	3-yr. ave. Yield per acre.	4-yr. ave. Yield per acre.
	bush.	bush.	bush.	bush.	bush.	bush.
Dreer Standard	528	840	596	379	605	[illegible]
Morgan Seedling	475	848	634	362	615	580
Everett	497	824	523	372	573	553
Money Maker	514	828	498	353	558	547
Rawlings Kidney	479	804	562	326	563	543
Wee McGregor	....	774	574	326	558	....
Gold Coin	....	841	514	307	[illegible]	....
Table Talk	....	659	540	247	482	....
Rochester Rose	453	807	526	326	553	528
Late Puritan	431	699	529	320	516	495
Empire State	585	590	478	316	485	472
Reeves Rose	484	659	456	316	477	479
Dalmeny Beauty	448	744	389	316	485	474
Vick Extra Early	431	625	515	316	485	472
Carman No. 1	356	536	530	313	459	434
Irish Cobbler	365	573	437	242	417	404

The following are the results for four years in comparing hill versus level cultivation:—

Variety.	1911.	1912.	1913.	1914.	4-yr. ave.
	Yield per acre. bush.	Yield per acre. bush.	Yield per acre. bush.	Yield per acre. bush.	Yield per acre. bush.
Hilled	225	620	567	244	414
Unhilled	279	645	527	291	437

Potatoes have been planted at different distances apart with the following results for the past three years:—

	1912.	1913.	1914.	3-yr. Ave.
	Yield per acre. bush.	Yield per acre. bush.	Yield per acre. bush.	Yield per acre. bush.
12 inches between plants, 30 inches between rows	557	505	271	478
14 " " " 33 " " "	609	528	242	460
15 " " " 36 " " "	570	394	242	402

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Different depths of planting have given the following results for the last three years:—

	1912.	1913.	1914.
	Yield per acre. bush.	Yield per acre. bush.	Yield per acre. bush.
Planted 2 inches deep	465	531	391
" 4 " "	659	540	297
" 6 " "	775	526	276

Two samples of Dreer Standard were cut at the same time, but planted two weeks apart with the following results: Cut and planted at once, 379 bushels per acre; cut and planted two weeks after cutting, 209 bushels per acre.

Conclusions derived from four years in growing potatoes: —

(1) Varieties to plant, quality alone considered, Irish Cobbler, Vick Extra Early, Wee McGregor. Varieties to plant, yield alone considered: Dreer Standard, Morgan Seedling. Varieties to plant, quality and yield considered; Wee McGregor, Rawlings Kidney.

(2) Plant on summer-fallow manured with rotten manure.

(3) Cut sets to two eyes, and plant 12 inches apart in rows 30 inches apart.

(4) Plant 4 inches deep, or shallower if the ground is clean, and cultivate before the plants are up.

(5) Hill the plants slightly and keep the ground between the rows well worked.

TREE FRUITS.

APPLES.

Of the trees planted in 1909 and 1910 only about thirty per cent are living and they are very much injured from winter-killing.

Of the one year old seedlings of Russian varieties received from Ottawa in 1912 and 1913 practically all are living and more than fifty per cent show no injury from winter-killing.

Four boxes of apples were received from A. P. Stevenson, Dunstan, Manitoba, in the fall of 1912 and the seeds were sown in a frame and left until they were one year old. They were planted in a nursery row in the spring of 1914 and eleven hundred of them survived the winter of 1914-15. It is hoped that from these large number of seedlings a hardy apple of good quality will be developed that is adapted to this climate.

PLUMS.

The settlers of this district are largely of German origin and many of them came here from Manitoba between 1894 and 1900 and brought with them some native plums from Manitoba. In many of the gardens there are now well developed plum trees yielding a fair amount of fruit of good quality. Of course these trees are of seedling origin and display many differences in point of earliness and quality. The Experimental Station is securing trees of similar origin with a view to making a selection of something that may be more uniform and if possible earlier and of higher quality.

ROSTHERN.

BUSH FRUITS.

BLACK CURRANTS.

These were planted in 1911 in rows six feet apart with the bushes 5 feet apart in the row. The yield in 1914 was as follows:—

Variety.	No. Plants.	Total yield in pints.
Clipper	6	26
Collins Prolific	6	24
Victoria Black	6	22
Buddenborg	5	21
Success	5	15
Eagle	6	18
Topsy	6	26
Boskoop Giant	6	25
Lee Prolific	5	19

RED AND WHITE CURRANTS.

The fruit of many of the red and white currants did not set properly and fell off shortly after the bloom had disappeared. The following table shows the yield from some of the more promising varieties that were planted in 1911:—

Variety.	Colour.	No. Plants.	Yield in Pints in 1914.
Red Grape	Red	6	12
Cumberland	"	6	6
Pomona	"	4	4
Raby Castle	"	6	27
Stewart	"	6	14
White Grape	White	6	6
White Cherry	"	6	8

RASPBERRIES.

Quality counts in raspberries and of those varieties tried at this Station the quality of the Herbert so far surpasses that of the others that it is unquestionably the variety to recommend for Northern Saskatchewan. Following are the yields from different varieties planted in 1911:—

Variety.	No. Plants.	Yield in Pints.
Turner	15	11
Loudon	23	35
King	23	13
Sunbeam	22	22
Herbert (planted in 1912)	4	14

ROSTHERN.

GOOSEBERRIES.

Most of the gooseberries planted at this Station have succumbed to the winter and of those that have withstood the winter there have been no satisfactory yields by which to determine their relative merits.

STRAWBERRIES.

Fair success has been attained with strawberries. They were covered with straw in the autumn after the ground was frozen and left covered in the spring until about the middle of May. The three varieties proved thus far to be most desirable are given below, the yield being that from a row 30 feet long, planted in 1912:—

Variety.	Yield in Pints.
Warfield	11
Parson Beauty	6
Dakota	11

FLOWERS.

The flower border extends along the south and east sides of the lawn and increases in beauty every year as the protection from the bordering shrubs develops.

The flowers are planted in massed clumps and show up well from the railway and public road. Some difficulty is experienced with the dry weather, but those varieties most resistant to drought are gradually selected to the elimination of others. The season is rather short for some varieties and these are started in the hotbed.

Tulips.—Tulip bulbs are received every year from Holland and planted in the autumn and well watered and covered with straw. As soon as the snow is gone in the spring they are uncovered and begin blooming the last week in April and continue for nearly a month. In 1913 the shipment arrived after the ground was frozen about four inches. Nevertheless the frozen ground was picked up, and the tulips were planted, and in 1914 they came on well and bloomed. The same bed does for a second year especially for those tulips of the Darwin variety. The Parrot tulips do not do as well.

Asters.—Unless the aster seed is sown in the hotbed or in boxes in the house the plants do not afford much bloom. In any case the bloom comes late in the season and is finally cut off with frost.

Antirrhinum.—Eighteen varieties were grown and they began to bloom early in August and continued until towards the end of October.

Balsams.—These did not begin to bloom until July 28, and were frozen down by a slight frost on August 10.

Carnations.—Two varieties, Improved Marguerite Mixed and Perpetual Early Flowering were in bloom from the middle of August to the end of October.

Coreopsis.—Five varieties were tried and were in bloom from the middle of July to the end of October.

Eschscholtzia.—Some mixed varieties came into bloom on July 11, and continued to the end of October.

ROSTHERN.

Nasturtiums.—Six varieties began to bloom in July and continued until the end of October.

Pansies.—Those of the year before began to bloom shortly after the ground was bare of snow and continued until after those from the new seeding were in flower. Plants from the new seeding began to bloom early in July and continued until the end of October. The Pansy is the one plant that affords bloom throughout the whole season.

Other plants which contributed much to the appearance of the flower border from July to October were: Clarkia Elegans, Cockscomb, Dianthus, Godetia, Kochia, Larkspur, Lobelia, Marigold, Mignonette, Nemesia, Petunia, Phlox, Poppy, Stock and Verbena.

Sweet Peas.—Collections—all of which gave very satisfactory results—were received from a number of seedsmen.

Gladioli.—Ten varities of gladioli were started in boxes in the hotbed and planted in the open on June 9th. They began blooming early in August and continued until hard frost at the end of October.

TREES AND SHRUBS.

In 1912 we desired a hedge across the north side of the plum orchard and secured some two year old Caragana plants and carefully planted them. At the same time we planted some Caragana seed in a nursery row. In 1914 the nursery row formed a thicker and more even hedge than those we had planted as two-year-old plants for hedge purposes.

A similar demonstration was made with regard to maple seedlings and trees from Russian poplar cuttings. If the seed or cutting is placed where the tree is wanted one is as far ahead in two or three years as if two year old seedlings had been planted. This is true of maple, caragana and Russian poplar but not of honey-suckle nor lilac because the early growth of these two is very slow.

The *Lonicera, Syringa, Caragana,* and *Spiraea* planted in the border in 1910 came into good bloom and were quite attractive by 1914.

Several of the mountain ash planted in 1910 and 1911 also came into bloom in 1914.

THE LAWNS.

An addition was made to the lawn last season by incorporating that piece of ground lying between the experimental hedges on the west and the foreman's house on the east. Also a portion, formerly in alfalfa, lying west of the Superintendent's house along the road and comprising about half an acre, was prepared for seeding in 1915.

Of various grasses and mixtures tried, the pure Kentucky Blue Grass makes the most satisfactory lawn. It seems to stand the drought as well as any, does not winter kill, and is even in colour and growth. White Dutch Clover is a desirable addition but it sometimes winter-kills.

ROSTHERN.

EXPERIMENTAL STATION, SCOTT, SASK.

REPORT OF THE ACTING SUPERINTENDENT, MILTON J. TINLINE, B.S.A.

The summer of 1914 was extremely warm and dry, particularly so during the month of July, and the fore part of August. Hot winds prevailed during these two months, and had a disastrous effect on crops of all kinds. The rainfall came in small showers and seldom penetrated to the roots of the plants.

The vegetable gardens on many of the farms in this district were sown on new land that had not been properly prepared. The dry season was particularly injurious to such, and many settlers have had to dispense with vegetables for domestic use. The potato crop, in quite a number of districts, was almost a complete failure, while in other sections about half an average crop was harvested.

On this Station corn and all late vegetables did not do well during the summer, and had only commenced to bear when the frost came in September. The drought also affected the flowers, resulting in a very small amount of bloom during mid-summer, with an abundance during the autumn months. Only a few hardy varieties of bush fruits bore this season. The ornamental, and the large fruit trees made satisfactory growth. The results obtained are as good as could be expected under the unfavourable weather conditions.

EXHIBITIONS.

During the past summer an exhibit, in conjunction with the Rosthern Station, was put on at the Saskatoon Summer Fair. A strong feature of the exhibit from this Station was the display of flowers and vegetables.

EXPERIMENTS WITH FRUITS.

TREE FRUITS.

Experimental work with fruit trees is receiving considerable attention. A number of difficulties have been experienced in the past which will disappear when more shelter for the trees can be provided. The fruit trees, and the hedges for providing shelter, were planted at the same time. Some loss of fruit trees has been experienced. The hedges, however, are beginning to provide shelter from the strong winds, and they will as they become larger, on account of their arrangement, provide protection from the injurious effects of the sun during the early spring months.

A number of varieties of hybrid apples, produced at the Central Experimental Farm, are making a strong growth. Some of the most promising are Elsa, Tony, and Northern Queen.

This year's addition to the orchard includes a number of second cross hybrid apple trees received from the Central Experimental Farm; a shipment of standard apple, plum, and cherry trees from a western nursery; 1,000 native plum trees from the Brandon Experimental Farm; 8,000 young seedling apple trees from Ottawa.

EXPERIMENTS WITH ORNAMENTAL PLANTS.

TREES AND SHRUBS.

The trees and shrubs have made satisfactory growth, notwithstanding the drought. A number of trees and shrubs were received from the Central Experimental Farm. These were used to fill vacancies in the arboretum and hedges, and to make additions to the ornamental plantings on the lawn.

Although the planting on the Station has only been carried on for the past four years, yet sufficient data have been collected to prove that there is quite a long list of trees and shrubs that will grow well in Northwestern Saskatchewan with no other care than the keeping the ground cultivated around the trees for the first few years.

DECIDUOUS TREES.

In newly settled districts where no trees are to be found, it is fast-growing trees that are in the greatest demand. Of the trees under test, Russian Poplar (*Populus petrowskyana*) and the Cottonwood (*Populus deltoides*) are two of the fastest growing. The Laurel-leaved Willow (*Salix laurifolia*) and Golden Willow (*Salix Voronesh*) are both quite hardy and free growers. Manitoba maple (*Acer Negundo*) and Green ash (*Fraxinus pennsylvanica lanceolata*), while not so rapid in their growth, are not so subject to disease, and are the most satisfactory for permanent plantations.

CONIFERÆ.

While evergreen trees are more difficult than deciduous to transplant and slower growing yet, once firmly established, the former are the better for windbreaks, and for ornamental purposes.

The White Spruce (*Picea canadensis*), Balsam Fir (*Abies balsamea*), and Lodge Pole Pine (*Pinus contorta Murrayana*) have proven hardy, and are used, not only in the Arboretum, but for hedges and ornamental plantings on the lawn where no protection is afforded by other trees.

FLOWERING SHRUBS.

Quite a number of flowering shrubs bloomed during the past season. One variety of the common lilac (*Syringa vulgaris* Congo) bloomed for the first time. A number of the Chinese species of lilac (*Syringa villosa*) bloomed quite freely. A splendid display was also made by the numerous varieties of caragana, spiræa, and bush honeysuckle.

HEDGES.

A number of the specimen hedges have grown very well. Among the most promising are the caragana, laurel-leaved willow, white spruce, and the Josika lilac.

HERBACEOUS PERENNIALS.

The collection of paeonies received in 1913, has grown very nicely, and makes a splendid addition to the flower border. The German iris, while usually equally hardy, has not made such a promising start. The Chinese bell flower appears very hardy, and is a prolific bloomer.

Two biennials that have added greatly to the appearance of the border, are pansies and sweet william. The former bloomed from early spring until covered by the winter snow. While these two plants are biennial, they, nevertheless, reseed the beds, and thus a succession of bloom is maintained from year to year.

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The usual shipment of flowering bulbs was not received in the autumn of 1913. The bulbs from the previous year were left in the beds. The bloom during the spring was not so uniform as the previous year, but a good display was made.

A few scillas and narcissi, that had been planted in the garden, bloomed again, These bulbs, however, are not to be recommended for outside planting.

A test of varieties of tulips, narcissi, crocuses and hyacinths for flowering production during the winter, was conducted. The following are among the most suitable for pot culture:—

Tulips.—Murillo, Imperator Rubrorum, Couronne d'Or, Proserpine, Keizerskroon, and Duchesse de Parma.

Narcissi.—Figaro, Sir Watkin, Emperor, Empress and Princeps.

Hyacinths.—La Grandesse, L'Innocence.

Crocuses.—Mixed.

ANNUAL FLOWERS.

While perennial flowers are very satisfactory, both from their economy of labour, and the permanency of the beds, yet in the newer districts annual flowers will be grown more largely for a few years.

On the Station, 160 varieties of annual flowers were under test last season. Most of the varieties were sown in the hot-beds, and transplanted to the garden early in June. This gives a much longer season for bloom than seeding outside.

A test was conducted with a number of kinds of the more rapidly growing flowers sown in the garden. Twenty-eight varieties were sown in a well cultivated piece of land. The results were very encouraging, notwithstanding the dry season.

The following list includes some of the more promising varieties for sowing in the open:—

Variety.	Began to Bloom.	Bloom Over.	Remarks.
Sweet Peas	July 13	Sept. 20	Hardy, prolific bloom.
Sweet Alyssum	" 15	Oct. 16	Suitable for edging beds.
Bartonia aurea	" 20	" 16	Splendid in masses.
Clarkia elegans	" 15	" 21	Free blooming.
Lupinus	" 25	" 21	Good for back-ground of garden.
Linum (Scarlet Flax)	" 20	Oct. 16	Splendid for bedding.
Leptosiphon (Hybrids)	" 15	Sept. 20	Splendid for edging.
Nasturtium	Aug. 15	" 21	Affected by drought.
Sweet Sultan	" 15	Frost	Very good in masses.
Viscaria cardinalis	" 15	Oct. 16	Splendid for bedding.

The following new annual flowers were tried out at this Station for the first time this year:—

Viscaria cardinalis.—Splendid for growing in masses. Height, six inches. A medium early bloomer.

Bartonia aurea.—A very free bloomer with bright yellow flowers. Height, fourteen inches. The seeds ripen quite freely here.

Leptosiphon (Hybrids).—This plant is quite suitable for edging, being only three inches in height, and quite a free bloomer. The flowers are of various colours.

BUSH FRUITS.

During the past few years quite a number of varieties of bush fruits have been planted. The exposure to which the bushes have been subjected has proven out the

SCOTT.

hardy kinds, and at the present time there are in the orchard 14 varieties each of red and black currants; 2 varieties of white currants; 7 varieties of raspberries and 2 varieties of gooseberries.

The following is a list of varieties that have proven hardy and borne fruit this past season:—

Raspberries—Sunbeam.
Black Currants—Kerry, Magnus.
Red Currants.—North Star, Stewart.
Gooseberries—Houghton.

STRAWBERRIES.

The past two seasons have proven very unfavourable to strawberry culture, having been too warm and dry. Two of the hardiest of a number of varieties tested were Dakota and Warfield. Both of these varieties fruited this last season.

EXPERIMENTS WITH VEGETABLES.

All the vegetables, with the exception of potatoes, were grown on the area set aside for vegetable tests. The soil is a dark chocolate loam, and was summer-fallowed in 1913. The plan of having sufficient land so that one-half the garden plot can be summer-fallow, putting the garden in on summer-fallow land each year, appears to be one that the farmers in Northwestern Saskatchewan, could follow to good advantage. By following this method the weeds are more easily kept under control, and sufficient moisture is available for successful gardening. Also, the farmers are enabled to do most of the preparatory work for the garden during the summer months, when their time is not so taken up with other farm work.

Weather conditions, as has been previously stated, were not conducive to large yields of vegetables. The quality, for the most part, was very good.

A quantity of seed from some of the best varieties of peas, beans, lettuce, and radish was saved, and will be tested against imported seed.

POTATOES.

The past season has been unfavourable to the potato crop. The dry weather during mid-summer checked the growth of the tubers until the late August rains came. The earlier maturing varieties had attained a fair size before their growth was stopped by the drought and thus matured before the autumn frosts. The later maturing varieties, however, did not ripen, and were harvested with the tubers immature, thus decreasing their yield.

A comparative test of the popular varieties of potatoes, has been conducted for three years. The following table gives the average results of 19 varieties that have been under test for this period:

POTATOES.—Test of Varieties.

Variety.	Size.	Type.	When Mature.	Average Yield For 3 Years.	
				Bush.	Lb.
Morgan Seedling	Large	Long White	Late	298	22
Rawlings Kidney (Ashleaf Kidney)	"	Kidney "	"	284	43
Wee McGregor	Medium	Oval "	Medium	275	9
Table Talk	Large	Long "	Late	260	42
Gold Coin	Medium	Oval "	"	251	34
Dreer Standard	Large	" "	"	248	50
Carman No. 1	"	" "	"	246	29
Rochester Rose	"	Long Pink	Early	244	29
Money Maker	Medium	" White	Late	242	17
Empire State	Large	Oval "	Late	219	45
Dalmeny Beauty	Medium	" "	Late	218	48
Everett	"	" Pink	Early	215	31
Irish Cobbler	"	" White	"	212	22
Late Puritan	Large	Long "	Late	205	17
Vick Extra Early	Medium	" Pink	Early	176	46
Reeves Rose	"	Oval "	"	155	28
Hard to Beat	Small	" White	Late	146	31
Factor	Medium	" "	"	115	10
American Wonder	Small	Round "	Medium	101	29

DISTANCES APART IN PLANTING POTATO SETS.

In addition to the test of varieties, a test of distances apart in planting potatoes was also conducted during the past season. The Wee McGregor variety was used for the test. The sets having three strong eyes each, were planted on May 23, at the distance apart outlined in the following table. The crop was harvested on September 23:—

POTATOES PLANTED AT DIFFERENT DISTANCES APART.

No.	Distance Apart between Rows.	Distance Apart in Rows.	Yield per Acre, 1914.	
	Inches.	Inches.	Bush.	Lb.
1	30	12	269	3
2	34	14	176	14
3	36	16	185	6

SCOTT.

BEETS.

Seven varieties were sown in the garden on May 21, harvested on September 29. The following varieties have been under test for the last three years:—

Variety.	Yield per Acre, 1914.	Average Yield 3 Years.	Remarks.
	Bush.	Bush.	
Early Blood, Red Turnip	900	962	Large, medium shape.
Ruby Dulcet	687	860	Large, uniform, excellent quality.
New Meteor	697	853	Large, uniform, excellent quality.
Egyptian Dark Red Flat	810	840	Rough, flattened.
Black Red Ball	697	617	Seed badly mixed.

Ruby Dulcet was much below its average yield this season. It can, however, be safely recommended. Eclipse and Cardinal Globe were tested at this Station, for the first time, this year. They appear to be promising sorts.

CARROTS.

Two varieties of carrots have been under test for three years. Of these, Half Long Chantenay has given an average yield of 296 bushels. Improved Nantes has given an average yield of 293 bushels. Both varieties are of excellent quality, and can be recommended.

BEANS.

Of the ten varieties under test, Wardwell Kidney Wax and Valentine Wax are two of the best for this district.

BRUSSELS SPROUTS.

The variety Dwarf Improved was grown again this season, and produced a large number of fair sized sprouts on each stalk. Their slow growth, however, gave them rather a strong flavour.

CABBAGE.

Seventeen varieties of cabbage were sown in the hotbeds, early in April, and transplanted to the gardens on May 29. Of these, the Early Paris Market and Early Jersey Wakefield are to be recommended for early use. The Copenhagen Market is a medium early, and reliable variety from the standpoints of quality and yield. Flat Swedish is one of the heaviest yielding late varieties. Danish Summer Ballhead and Large Late Flat Drumhead might also be mentioned. Of the red varieties, Danish Delicatesse is the best that has been tested.

CAULIFLOWER.

Three varieties were tested; of these, Early Snowball gave the largest percentage of good heads, and was superior to the others in texture and flavour.

SCOTT.

CUCUMBERS.

Five varieties were under test. The dry season checked the growth in mid-summer, resulting in some low yields. The Prize Pickling gave the heaviest yields, with Cool and Crisp second.

LETTUCE.

Ten varieties were tested. Of these, Iceberg is suggested for early use, and Giant Crystal Head and Dreer All Heart for later sorts.

ONIONS.

Ten varieties of onions were sown in the garden on April 18. Notes were taken on colour, shape, percentage of thick necks, etc. It was found that Red Australian Brown had the lowest percentage of thick necks, Red Globe and Johnston Dark Red Beauty the highest. White Globe gave a yield of 796 bushels per acre, and is a fine attractive onion. Danvers Yellow Globe was second, with a yield of 607 bushels.

PEAS.

Of the fifteen varieties under test, Gregory Surprise, and American Wonder are two of the best early sorts. Stratagem is one of the best later kinds. Quite Content, which was under test for the first time at this Station, bore some very fine large pods, which were well filled.

PUMPKINS.

Two varieties were tested. Of these, Connecticut Field gave the heaviest yield. The pumpkins did not become very large, but were of excellent quality.

TOMATOES.

Ten varieties were sown in the hotbeds early in April, and transplanted to the gardens on June 5. The plants were severely pruned during the early summer. The fruit was just beginning to ripen at the time of the frosts. It was found that the green fruit, placed in windows with a sunny exposure, ripened very well when brought in the house.

In addition to the above, parsnips, radish, turnips, salsify, and parsley were also tested, making, in all, twenty kinds of vegetables with a total of 136 varieties.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

In regard to the amount of moisture carried in the soil from 1913, which is always an important factor in considering any season's results, it might be said that the precipitation during the last four months of that year was light, amounting in all to only two and one-half inches. During this period heavy drying winds were prevalent with little or no snow on the ground so that the soil moisture was severely drawn upon. To counteract this in a measure, however, 3·63 inches of precipitation was received during the first three months of 1914, so that the soil was reasonably moist and in excellent condition when work on the land was started.

The first work on the land at the Station was done March 17. The ground froze up towards the latter part of March but opened again shortly and by April 4th there was not much frost left in the land. Unfortunately the rainfall during April and May, and until the latter part of June was very much less than usual. For this entire period no soaking rain was experienced, and what did come was in the form of light showers that were not sufficient to wet through the dry layer of two or three inches at the surface and connect with the moisture lower down. The fact that the total precipitation for April was only 0·5 of an inch and for May 0·3 of an inch fully illustrates how serious conditions were and how difficult it was to obtain a stand from seeds when sown. A wet spell during the last ten days of June revived things generally, but the dry hot July was too severe a strain on plant life and the result was that there was a practical failure of all vegetables on non-irrigated land except potatoes and late sown roots and corn, which were able to profit somewhat by the rains during August.

The last frost occurring in the spring was on May 12th when 29·8° was recorded but a temperature of 33·2° was registered on the 21st, when tender foliage was affected in certain localities. The first frost registered in the fall was on September 15th when 31·0° was reached but this appeared to do much less damage to foliage than one would expect; in fact it was not till the 7th of October, when 20·1° was recorded that potato vines were completely blackened. On this account the autumn was particularly favourable for late flowering annuals which made a brave showing till nearly the middle of October.

LESSONS FROM THE SEASON FOR THE DRY LAND FARMER.

On account of the excessive drought, the season has been, with the possible exception of 1910, the most trying that has been experienced in Southern Alberta since settlement has taken place. It is therefore fitting that we should look over the results, or perhaps lack of results, and draw as many profitable lessons as possible therefrom and, although trusting that we shall not soon be called upon to experience a similar one, be prepared as far as possible to make the best of conditions should they recur.

The necessity of having summer-fallowed land carefully prepared on which to plant the garden has never been emphasized more forcefully than in this year. Gardens planted on well fallowed land that grew no crop of any kind (weeds included) in 1913, *did* produce some vegetables this year while those not thus planted failed miserably. On this account it will perhaps be excusable to reiterate a few suggestions that have previously been given in this connection. The land on which a garden is

to be planted on a dry land homestead should not only have been carefully summer-fallowed the season previous but should contain a liberal amount of barnyard manure, well incorporated therein. This can best be done by applying well-rotted manure just before it is ploughed for summer-fallow. Manure worked in in this way increases the ability of the soil to retain moisture, besides improving its tilth. Manure should never be applied on non-irrigated land the same season that the crop is planted. Every dry-land farmer should set aside for the kitchen garden just twice the amount of land that he intends to put in in any season. One-half should be manured as mentioned above. In May or early June it should be ploughed at least eight inches deep. During the rest of the season sufficient cultivation should be given to prevent the growth of all vegetation. The land should not be ploughed the following spring but be given sufficient surface cultivation to prepare a good seed bed. The chances of success are greatly increased by having a shelter belt of trees planted on the windward side (which is, of course, not necessarily on the north side) for besides protecting the land in a great measure from the effects of the drying winds, it is almost certain to collect a bank of snow, which is a great advantage. If conscientious cultivation is given so that a loose mulch is maintained at all times on the surface, it is surprising how well vegetables can be made to yield in even quite dry seasons. It is needless to point out the advantage of making the rows continuous and wide enough apart so that a horse cultivator can be used, which reduces the amount of hand-hoeing that would otherwise be necessary.

LETHBRIDGE.

THE VEGETABLE GARDEN.

At the Station we are operating two farms, one irrigated and the other non-irrigated. So far the greater part of the work in horticulture has been carried on under irrigation. This season we did not have a vegetable garden on the non-irrigated farm although a large number of varieties of potatoes were tested without irrigation and owing to the August rains good yields were obtained. Corn also made an extremely creditable showing. Only early and extra early sorts were tried.

POTATOES (NON-IRRIGATED).

Twenty-six varieties of potatoes were tested. They were all planted May 5 on summer-fallowed land in rows 30 inches apart and the sets about one foot apart in the rows. The potatoes were cut in fairly good sized pieces and in such a manner as to leave as much skin as possible on each set. When the sets are cut wedge-shaped or in such a manner as to have a large part of the outside cut surface, the piece is more apt to dry out and fail to grow if dry weather is met with just after planting, and it is more apt to rot in case of very wet weather. They were all dug October 20. The yield was computed in each case from 1/60 of an acre.

No.	Variety.	Total Yield per acre.		Yield per acre marketable.		Yield per acre unmarketable.	
		Bush.	lb.	Bush.	lb.	Bush.	lb.
1.	Irish Cobbler	400	00	351	40	48	20
2.	Green Mountain	398	20	358	20	40	00
3.	Gold Coin	380	00	346	40	33	30
4.	Rawlings Kidney (Ash Leaf Kidney)	373	20	320	00	53	20
5.	Factor	371	40	333	20	38	20
6.	Wee MacGregor	368	20	333	20	35	00
7.	Money Maker	355	00	318	20	36	40
8.	Rochester Rose	353	20	323	20	30	00
9.	Carman No. 1	336	40	300	00	36	40
10.	Vick Extra Early	316	40	283	20	33	20
11.	Dalmeny Beauty	306	40	266	40	40	00
12.	Dreer Standard	300	00	268	20	31	40
13.	Morgan Seedling	298	20	251	40	46	40
14.	Late Puritan	290	00	241	40	48	20
15.	Empire State	288	20	248	20	40	00
16.	Table Talk	266	40	230	00	36	40
17.	Early Hebron (White)	253	20	233	20	20	00
18.	Houlton Rose	231	40	205	00	26	40
19.	Early Ohio	230	00	215	00	15	00
20.	Reeves Rose	220	00	186	40	33	20
21.	American Wonder	216	40	183	20	33	20
22.	Hard to Beat	166	40	153	20	13	20
23.	New Queen	145	00	143	20	1	40
24.	Everett	100	00	83	20	16	40
25.	Hebron (Pink)	55	00	51	40	3	20
26.	Early Norther	36	40	33	20	3	20

POTATOES (IRRIGATED).

The same varieties were tested on irrigated land as on the non-irrigated. They were planted May 18 in freshly broken alfalfa sod that was ploughed just before the potatoes were put in. Unfortunately, the land was not particularly moist when the planting was done, and as no rains followed the stand secured was most uneven and the resulting yields obtained cannot be entirely depended upon as indicating the relative productivity of the various kinds, as the low yields in some cases were without doubt due to the poor stand. They were irrigated three times, on July 21 and 28, and August 7.

No.	Variety.	Total yield per acre.		Yield per acre marketable.		Yield per acre unmarketable.	
		Bush.	lb.	Bush.	lb.	Bush.	lb.
1.	Gold Coin	548	20	500	00	48	20
2.	Reeves Rose	568	20	458	20	50	00
3.	Irish Cobbler	495	00	455	00	40	00
4.	Carman No. 1	495	00	436	40	58	20
5.	Factor	473	20	428	20	45	00
6.	Table Talk	450	00	408	20	41	40
7.	Rawlings Kidney (Ash Leaf Kidney)	420	00	375	00	45	00
8.	Dalmeny Beauty	411	40	361	40	50	00
9.	Wee MacGregor	405	10	373	30	31	40
10.	Vick Extra Early	395	00	355	00	40	00
11.	Rochester Rose	393	20	351	40	41	40
12.	Dreer Standard	321	40	286	40	35	00
13.	Morgan Seedling	306	40	275	00	31	40
14.	Green Mountain	253	20	226	40	26	40
15.	Early Ohio	236	40	215	00	21	40
16.	Money Maker	198	20	193	20	5	00
17.	Empire State	191	40	175	00	16	40
18.	Houlton Rose	190	00	175	00	15	00
19.	Late Puritan	186	40	163	20	23	20
20.	Early Hebron (White)	180	00	171	40	8	20
21.	American Wonder	140	00	133	20	6	40
22.	Everett	119	10	105	00	14	10
23.	Early Hebron (Pink)	106	40	100	00	6	40
24.	New Queen	55	00	55	00	......	
25.	Early Norther	55	00	55	00	......	
26.	Hard to Beat	33	20	33	20	......	

IRRIGATION OF POTATOES.

As holders of small tracts of irrigated land in the district are beginning to pay considerable attention to the growing of this crop a few suggestions in regard to the irrigation might not be out of place.

There is perhaps no crop that is so easily injured by poorly timed irrigation, so far as quality is concerned, as is the potato crop. Undoubtedly the criticism that is so often heard that potatoes grown on irrigated land are watery and lack the mealiness of dry land potatoes is often just. This difficulty can be overcome by giving attention to the time and manner of irrigation and to one or two other details. The variety selected is important, for the tubers should be mature, if possible, when dug. For this reason early varieties are desirable but they will not yield as heavily as those not so early. If a medium to late variety, such as the Gold Coin or Wee McGregor is used, it is well to have them planted in good season, preferably not later than May 15. In this connection it would be well to mention that at the Station we have found the Gold Coin an excellent variety, being one of the heaviest yielders of any of the kinds yet tested and a good keeper.

The land on which potatoes are planted should be as rich as possible so that a rapid growth is obtained. Alfalfa sod gives almost ideal conditions. The first irrigation should be deferred if possible until the plants are in bloom, although they can, and should, be irrigated earlier if the soil becomes dry. This irrigation should be carefully given. A thorough soaking is not desired for it is apt to cause too sudden and rapid growth. It has been found that best results are obtained if the water is allowed to run down every other row only, and the lighter this irrigation is, the better. It is needless to point out that the rows should be so arranged that they are parallel with the slope of the ground so that the water will readily run down between the rows and not flood the tops. This is a distinct disadvantage for it is probably impossible to produce a dry potato if the tops have to be flooded when irrigating.

The second irrigation should follow the first in about 10 days and the third about 10 days after the second. The water should be run between every row at these irrigations. The last irrigation should not be later than the 10th or 12th of August, as an effort should be made to allow the ground to dry and induce the potatoes to mature as much as possible. After the crop has once been irrigated the land should not be allowed to become dry before the next irrigation is given. If, however, for any reason it should become dried out, no later irrigation should be given, for if it is, a new growth is stimulated and the quality of the potato is almost sure to be injured and will be found to be somewhat watery and immature when dug. The idea in irrigating potatoes is that after the first application of water is made the soil should be kept continuously moist, forcing as rapid development as possible and then by stopping irrigating early enough in the season, allow the potatoes to mature before digging time. Usually the first irrigation, depending largely on the character of the season, is given about July 20, the second July 30, and the last August 10. It will be found that it is not wise to dig the potatoes as soon as frost kills the tops, but that they mature considerably if left in the ground till a few weeks later. We believe that it is good practice to allow them to remain as long as it is safe to defer digging.

VEGETABLES.

The following vegetables were all grown on irrigated land:

Beans.—These are usually a rather uncertain crop. It is not well to plant them too early and only extra early varieties should be used. Ten varieties were planted May 20, and three ripened perfectly. These were Extra Early Valentine, Valentine Wax, and Wardwell Kidney Wax.

Beets.—Nine varieties were tested and they all did well. Beets, like all the root crops, are well adapted to our conditions. The Ruby Dulcet gave the heaviest yield.

Cabbage.—Cabbages and cauliflower reach a high state of perfection as they thrive with cool nights on our rich soil. The plants should be started in hot beds and set out the last of May. Twenty-two varieties were tested and all did well. The following appeared to be the best of those tried:—Early crop; Early Jersey Wakefield, Early Paris Market, and Copenhagen Market. Main crop: German Nofalt, Round Empress, Danish Succession, Fottler Improved Brunswick.

Winter crop.—Danish Winter Roundhead and Extra Amager Danish Roundhead.

Cauliflower. Four varieties were grown. The Early Half Long Scarlet did the best.

Celery.—Seven varieties were tested. The seed was sown in the hot bed April 14. Any time during the last few days of May and the first few days of June is probably the

best time to put them out in the garden. The best ones of these tried were Improved White Plume, Noll Magnificent, Evans Triumph and Giant Pascal. The first named was the earliest.

Corn.—The season proved a particularly favourable one for corn. Ten varieties were tested and they all produced satisfactory ears for table use, but all of them did not mature seed. The earliest was the Squaw, which was ready for use July 30. The Early Malcolm can be recommended as early and good in quality. The Golden Bantam although not always early enough for our season is perhaps the best in quality.

Cucumbers.—Five varieties were tested. Peerless, Prize Pickling and Cool and Crisp can be recommended.

Citrons.—These do best when started in hotbeds, but to transplant successfully the roots should not be disturbed.

Lettuce.—Ten varieties were under test. The first ready for use was Grand Rapids.

Onions.—The safest way to mature onions here is to use Dutch sets but if seed of extra early sorts is sown early in April, a crop is usually obtained. Thirteen varieties were tested and they all produced a good crop, hardening up well. The White Pearl and White Early Barletta were the earliest.

Parsnips.—Two varieties were grown and as usual did well. Any of the standard varieties will be found satisfactory.

Peas.—These are a crop that can always be relied upon. Fifteen varieties were under test. The earliest were the Thomas Laxton and the Gradus. These two varieties are not only quite early but are excellent in quality. For a later sort the Telephone is one that can be recommended for yield and quality.

Radish.—Forcing Turnip Scarlet and Early Scarlet White Tipped were early and satisfactory.

Squash and Marrow.—Ten varieties were tested. The Golden and Green Hubbard and the Long White Bush Marrow did well.

Turnips.—Extra Early White Milan and Extra Early White Flat Strap Leaved can be recommended for early use.

Tomatoes.—With tomatoes it is a question of getting the earliest sort available. They have to be started under glass, and should be kept sturdy. Plant out the early part of June or as soon as danger of frost is past.

FRUITS.

STRAWBERRIES.

The results from strawberries have not been as satisfactory as usual. Heavy winds at the time the blooms were setting appeared to injure the crop materially, for although there were as many berries as usual, they were small and many were misshapen.

Twenty-eight varieties were under test. Taking everything into consideration the Senator Dunlap was still as satisfactory as any tried, although the following varieties all yielded slightly in excess of Senator Dunlap; August Luther, Pocomoke, Bismarck, Sample, Minute Man, Williams and Tennessee Prolific.

LETHBRIDGE.

RASPBERRIES.

Of the raspberries under test the Marlboro, Early King, Loudon and Ruby can be recommended as the most satisfactory.

In setting out a patch of raspberries, the rows should be at least 8 feet apart and the plants about two feet apart in the rows. As it is necessary to bend the canes over in the fall and cover completely with earth the rows have to be a good distance apart so that a trench, from which to obtain the earth, can be dug between without disturbing the roots to any great extent. The canes should be kept thinned so that the rows are not over 8 to 10 inches wide. Uncover in the spring as soon as the buds start to swell. We find that unless the plants are covered completely with earth in this way, the canes will either kill back or become so dried out during the winter that they will bear but little, if any, fruit. Do not attempt to use barnyard litter or manure, as a substitute for the earth, as neither is satisfactory. Always keep the patch well cultivated.

CURRANTS.

The yield of fruit from the currants this summer was perhaps the most satisfactory that has been obtained since the plantation was set out. Of the varieties under test the following gave the best yields this year:—Black: Merveille de la Gironde, Bang Up, and Ontario. White: Large White, White Brandenburg and White Grape. Red: Red English and Long Bunched Holland.

APPLES.

We were again successful in raising apples from a number of trees. The amount produced was not so great as last year owing to the fact that excessively heavy winds at the time the trees were in bloom prevented the fruit from setting properly. This emphasizes the need of a good, fairly high windbreak before one can count on any measure of success with apples or for that matter with any kind of fruit. Although the quantity of apples produced was not so great as last year it is encouraging to note that a larger proportion of them were from standard varieties. The trees in the irrigated and non-irrigated orchards yielded about equally well. The following is a list of the varieties that fruited:—

Standard.—Hibernal, Simbirsk No. 9, Grand St. Jean, Yellow Transparent, Charlamoff, Okabena, Stone, Dudley, Duchess, Lowland Raspberry and Patten Greening.

Cross Breds.—Tony, Bow, Jewel, Robin, Pioneer, Silvia, Prince, Norman, Magnus, Kent, and Mecca. These are about the size of ordinary crabs or average a trifle smaller.

Crabs.—Excelsior, Cottage, Dartt, Lyman, Hyslop, Florence, and Transcendent.

ORNAMENTAL GARDENING.

The flowering shrubs made a particularly good showing this year. The lilacs bloomed more freely than ever before. The roses did well. All of the shrubs bloomed that were reported last year and the amount of bloom was as a rule greater.

FLOWERS.

The bulbs came on well, but owing to the dry windy weather early in the spring did not last as long as usual. Annuals: The annuals started in hotbeds and set out bloomed well and lasted till late in the fall. The following are some that did well, and are ones that can usually be depended upon:—Sweet peas, asters, pansies, stocks, verbenas, antirrhinums, larkspurs, petunias, French and African marigolds, phlox, coreopsis, dimorphotheca, scabiosa, zinnias, balsams, alyssum, and nasturtiums. Ten varities of gladioli were tried and did exceptionally well.

A large number of perennials have been started. Every flower lover should endeavour to increase the number of these in his garden for they bloom much earlier than annuals and are easy to raise.

TREES FOR WINDBREAKS.

The question of windbreaks is such an important one that suggestions in this connection cannot be repeated too often. The trees that have been used most extensively at the Station, and the ones that seem to be the most satisfactory, are the native cottonwood and the sharp-leaved, laurel-leaved and golden willow. The last one is perhaps not quite so hardy as the two former, but grows a trifle faster. The caragana does not grow so tall but is absolutely hardy, and is ornamental. There are also a number of hardy Russian poplars that could be mentioned.

There are just two essentials to the successful growing of trees under our conditions: the land should be deeply ploughed and summer-fallowed the previous year, and after the trees are set out they should be kept cultivated carefully all summer. Trees cannot be successfully grown among grass and weeds.

LETHBRIDGE.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

The spring and summer of 1914 were favourable for the production of vegetables and fruits of good quality. The latest spring frost occurred on May 29, but was not heavy and did not injure fruit blossoms. The earliest fall frost came on September 1. The precipitation for the growing months from April to August inclusive was 9·905 inches. Trees in the arboretum made good growth, ripened up their wood well and came through the winter in good condition.

Less injury from wind was experienced in the garden during the past season than in previous years. The growth of windbreaks will doubtless further reduce this injury each season.

ORCHARD.

For the second year in succession the orchard produced a small quantity of cross-bred apples from the following varieties: Charles, Progress, Prince and Eve, while the following produced fruit for the first time: Aurora, Jewel, Robin and Pioneer.

This fruit is fine in texture and of fair flavour. The quality of the jelly made from these apples is superior.

There are approximately 6,000 apple seedlings in the orchard from the following varieties: 70 August, 430 Anisim, 220 Antonovka, 415 Baraboo, 140 Charlamoff, 1,135 Hoadley, 720 Iowa Beauty, 295 Moscow Pear, 870 Anis, 90 Anis Rose, 65 Blushed Calville, 80 Bogdanoff, 165 Grandmother, 350 Hibernal, 90 Lowland Raspberry, 650 Patten Duchess, 130 Un-named.

Many of these seedlings give promise of producing trees both hardy and of fair type, and it is hoped that fruit of good quality may be obtained from a fair percentage of them. The fact that a number of cross-bred apple trees have wintered successfully for several years is evidence that hardy sorts of standard apples may be obtained through persevering efforts.

PLUMS AND CHERRIES.

No success has yet been achieved in the growing of plum or cherry trees, even seedling plum trees secured from Manitoba have not wintered, and it is evident that the climate is particularly trying on this class of tree growth.

SMALL FRUITS.

CURRANTS.

The bushes in the new plantation of currants made satisfactory growth, and should be of sufficient size to produce quite a quantity of fruit in 1915. Herewith is given a table showing the standing of varieties of red, white, and black currants as determined by the production of fruit during the past four years. The yield is taken

from three bushes of each variety, and as the bushes are 6 feet apart in the row and the rows 6 feet apart the yield per acre may be computed on the figures given:—

Variety.	1911.		1912.		1913.		1914.		Average.	
Black Currants.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
Climax	8	6	19	14	4	4	1	2	8	6½
Ontario	10	0	16	13	4	8	4	6	8	14¾
Winona	5	4	12	6	1	8	0	4	4	13½
Saunders	13	8	20	8	6	5	1	9½	10	8
Ethel	7	11½	10	5	11	8	1	14	7	13½
Topsy	8	15	14	10	6	4	0	9	7	9½
Success	1	13½	10	3	21	4	...	...	10	17½
Magnus	6	9½	20	1	32	8	...	...	19	12
Bang Up	6	10½	13	0	17	0	8	14	11	6
Ogden	6	2	7	13	14	18	14	3	10	10½
Eclipse	0	9	9	4	4	8	4	8	4	11¼
Kerry	8	3½	19	12	2	4	2	11	8	3½
Eagle	10	12	21	14	5	12	4	1	10	10
Merveille de la Gironde	6	5	23	3	27	0	23	9	20	0
Norton	6	5	15	9½	17	0	2	14	10	7
Beauty	15	4	32	12	30	12	6	4	20	12
Monarch	3	9	26	14	28	8	1	7	15	1
Lee Prolific	3	5	18	4	31	4	9	14	15	11
Red Currants.										
Cumberland Red	1	3½	10	4	5	8	3	8	5	2
Victoria	2	13	17	8	2	5	1	2	6	3
Frauendorfer	3	10½	7	8	...	...	...	...	5	9¼
Red English	0	8½	4	0	5	0	5	13	5	13
Red Dutch	0	10	10	4	17	8	14	6	13	3
Prince Albert	1	0½	24	12½	19	14	40	..	21	7
Rankins Red	1	3	6	9	14	6	23	15	11	8
Fay Prolific	6	5½	13	13	1	10	..	8	5	9
Champagne Red	2	2	6	6	3	11	3	12	3	15
La Conde	4	15½	11	10	9	0	9	2	8	11
Benwell	3	6½	11	7	12	14	7	10	8	14
Wilder	...	...	11	0	1	7	3	0	5	2
Red Dutch (new)	1	0	13	15	19	5	13	3	11	14
Pomona	1	14½	7	8	14	2	3	12	6	13
Long Bunched Holland	0	8	16	12	26	14	18	11	15	10
Raby Castle	0	4	7	6	4	8	9	14	5	8
Moore Seedling	4	12	1	6	4	0	15	6	6	6
Early Scarlet	7	7½	2	10	4	1	3	7	4	6½
Red Grape	1	4½	4	1	6	14	8	15	5	4½
Large Red	2	7	10	15	10	0	1	3	6	2
Wentworth Leviathan	...	...	6	3	7	4	2	4	5	4
White Currants.										
White Grape	1	2	12	14	9	8	6	6	7	9
White Kaiser	0	7½	2	3	1	3	...	...	1	5
Wentworth Leviathan	0	8	...	...	...	...	...	...	0	8
Climax White	...	1	1	7	5	1	3	1	2	6
White Pearl	...	...	0	15	2	14	6	11	3	8
Eyatt Nova	0	2	3	3	0	12	0	4	1	1
Verrieres White	0	2	1	5	2	0	...	...	1	2
Large White	0	4½	5	3	2	10	...	...	2	11
Large White Brandenburg	0	10½	10	15	5	9	6	14	6	0
White Cherry	0	4½	11	4	15	0	16	1	10	1

GOOSEBERRIES.

It has been found necessary to cover gooseberry bushes completely with earth if they are to winter successfully. Various other methods of providing winter protection have been tried but without success. The first fruit to be secured was obtained in 1914, following the covering of the bushes with earth during the winter of 1913-14. The varieties Richland and Carrie produced a small quantity of fruit. In 1915 it is proposed to increase the number of varieties of gooseberries under test.

LACOMBE.

RASPBERRIES.

A very satisfactory yield of raspberries was secured in 1914. The yield shown in the table is from an area 36 by 6 feet, and as the highest yielding variety produced 24¾ pounds it will be seen that the yield per acre is 4,974 pounds for that variety:—

Variety.	Yield for 1914.		Average yield for 4 years.	
	lb.	oz.	lb.	oz.
Loudon	21	8½	7	13
Early King	22	5½	11	11
Sarah	24	12	12	7
Shaffer Colossal			0	9
Herbert	1	11	9	13½
Golden Queen	8	7	4	5
Sunbeam	8	3	5	3
Cuthbert	4	15	4	15

STRAWBERRIES.

Difficulty has been experienced in getting a good stand of plants. From our experience during the last few years we are led to believe that it may prove advisable to defer transplanting till towards the end of May, or until the rainy season opens. The dry windy weather, so common early in May, renders it difficult to get the young plants to root uniformly. A second difficulty has been met in rooting the runners in the fall. Again, at this season of the year the weather is usually dry and occasionally windy and frequently the plants are blown about to such an extent that a callus is formed where the young roots should be thrown out. This condition is best offset by fastening the runners down at the point where the young plant is developing, with a forked branch of a willow, or with a wire staple such as is used for fencing.

A new plantation of strawberries was planted for fruiting in 1915. A light yield of fruit was secured from the following everbearing varieties: Model, Americus, Progressive, Iowa.

VEGETABLES.

BEANS.

A fair yield of wax beans was secured in 1914, and the following table will show the yield during the past season as well as the average for four years of the varieties named in the table. Seed was sown in the open on May 20, and the yields given are from one row 30 feet long:—

Variety.	Ready for Use.	1914.		Average for 4 years.	
		lb.	oz.	lb.	oz.
Wardwell Kidney Wax	Aug. 11	9	8	9	14
Valentine Wax	" 5	10	4	13	7
Early Refugee	" 5	11	15	15	9¼
New White Stringless Green Pod	" 15	14	14	13	1
Refugee or 1000 to 1	" 27	12	0	8	3
Keeney Rustless Golden Wax	" 15	8	8	12	8
Bountiful Green Bush	" 5	15	14	29	10
Grennell Rustless Wax	" 5	14	4	14	4

BEETS.

Ten varieties of beets were sown in the open on May 6, in rows 30 feet in length. The varieties first ready for use were Ruby Dulcet and Early Blood Red Turnip. These varieties were also of satisfactory quality. The following table shows the yield for the past four years as well as the average for that period:—

Variety.	1911.		1912.		1913.		1914.		Average.	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
Ruby Dulcet	40	8	36	0	48	6	114	8	59	13½
Black Red Ball	22	0	15	0	50	12	79	8	41	12
Early Blood Red Turnip	48	0	41	0	99	1	96	0	71	0
Egyptian Dark Red Flat	11	8	41	0	43	12	76	0	44	1
Eclipse	55	12			48	12	117	9	74	1
Klein Rabbelghe	10	0							10	0
Egyptian	60	0					28	0	44	0
Meteor	43	8	15	0	62	2	108	0	57	2½
Cardinal Globe							29	0	29	0
Danish Blood Turnip							12	0	12	0

CABBAGE.

The yield of cabbage in 1913 was the greatest on record, but the yield of 1914 rather closely approaches the record figures. The table given herewith gives the yield of the varieties tested during the past four years and the average yield for those varieties under test for that length of time:—

Cabbage.	1911.		1912.		1913.		1914.		Average.	
Early Jersey Wakefield	88	0	20	3	108	0	78	1	73	9
Large Late Flat Drumhead	47	0	60	0	164	0	122	6	98	4
Extra Early Midsummer Savoy	31	0	30	0	50	0	63	11	43	11
Lubeck	12	0	56	0	122	0	104	2	72	8½
Magdeburg	34	0	55	0	161	0	96	5	86	9
Small Erfurt			41	0	106	0	49	12	65	9
Winningstadt	43	0	48	0	142	0	99	14	83	3
Danish Ballhead	56	0							56	0
Danish Summer Ballhead	68	0	43	0	119	0	90	0	80	0
Flat Swedish	104	0	72	0	145	0	116	0	109	4
Imp. Amager Danish Roundhead	103	0	39	0	126	0	118	14	96	11½
Extra Amager Danish Ballhead	89	0	33	0	80	0	92	7	73	9¾
Copenhagen Market	88	0			144	0	181	9	137	14
Early Paris Market			38	0	108	0	77	12	74	9
Fottler Improved Brunswick			56	0	32	0	154	7	80	13
German Nofalt							145	10	145	10
Round Express							153	11	153	11
Danish Succession							121	3	121	3
Danish Winter Roundhead							93	3	93	3
Red Cabbage.										
Danish Stonehead	30	0	12	0	19	0	73	10	33	9
Danish Delicatesse			8	0	50	0	66	5	41	7
Danish Stonehead (Roundhead)							53	5	53	5

LACOMBE.

CELERY.

Seed was sown in the hotbed April 2, pricked into the cold frame May 23, and re-set June 6. The quality was not very good. The following table shows the yield for the past four years, as well as the average for that period:—

Variety.	1911.		1912.		1913.		1914.		Average.	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
White Plume					21	0	29	0	25	0
Paris Golden Yellow	5	0	16	0	19	0	14	8	13	10
Giant Pascal	21	0	43	0	35	0	33	0	33	0
Evans Triumph	19	0	37	0	38	0	44	0	34	0
Noll Magnificent	18	0	34	0	37	0	40	8	32	6
French Success	14	0	37	0	31	0	24	0	26	8
Improved White Plume							12	8	12	8
Rose Ribbed Paris	15	0	25	0	28	0			22	11

CAULIFLOWER.

The variety of cauliflower first ready for use was Earliest Dwarf Erfurt which came in August 8. Of the three varieties under test the yield places them in the following order: Danish Giant Dry Weather, Earliest Dwarf Erfurt and Earliest Dwarf Snowball No. 24.

CARROTS.

Seed was sown in the open on April 10, and the variety Improved Nantes was ready for use on the first of August. The rows were 30 feet in length and the figures submitted give the yield for one row of each variety:—

Variety.	Yield in 1914.	
	lb.	oz
Improved Nantes	72	8
Half Long Chantenay	107	4
St. Valery, Long Red	35	0
Improved Nantaise Early Half Long Scarlet	27	8
Improved Scarlet Intermediate	30	4
Danish Yellow Champion Stock	28	0

CORN.

The season of 1914 was favourable for the production of corn. Seed of the following varieties was planted on May 6; Early Iowa, Metropolitan, Perkins Extra Early Market, Early Fordhook, Squaw, Pocahontas, Early Dawn, Golden Bantam, Early Malcolm.

Of the above varieties the following three produced corn fit for table: Early Dawn, Early Malcolm and Squaw. Only the latter variety ripened seed.

LETTUCE.

The following varieties were tested in 1914: Red Edged Victoria, Dark Green Capucine, Giant Crystal Head, Hanson Improved, Iceberg, Unrivalled Summer. Rousseau Blonde Winter, Grand Rapids, Black Seeded Simpson, All Heart.

LACOMBE.

For the past season, for earliness and quality, these varieties would rank as follows: All Heart, Iceberg, Black Seeded Simpson, Unrivalled Summer, Giant Crystal Head.

ONIONS.

The following varieties of onions were tested in 1914: Red Australian Brown, Early Flat Red, White Queen, Very White Pearl, Great Red Wethersfield, Red Globe, White Early Barletta, Dark Red Beauty, Extra Early Red, White Globe, Yellow Globe, Danvers Yellow Globe, Large Red Wethersfield.

The standing of these varieties in the matter of yield and in maturity at harvest time is as follows: Large Red Wethersfield, Yellow Globe, Red Globe, Danvers Yellow Globe, Great Red Wethersfield.

PARSNIPS.

Two varieties of parsnips were tested, the Intermediate and Improved Hollow Crown. The latter variety gave the highest yield, producing fifty pounds from one row 30 feet in length.

PEAS.

A splendid crop of peas was produced in 1914. The quality was as usual very good indeed and the season long. Seed was sown in the open on the 21st of April, and the yield as given is from a row 30 feet in length. The table gives a yield as far as possible of every year since 1911, together with the average of the four years of those varieties tested for that length of time:—

Variety.	1911.		1912.		1913.		1914.		Average.	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
Dainty Duchess							28	4	28	4
Gradus	5	14	22	1	16	4	28	14	18	4
Excelsior	12	3	12	14	14	12	23	12	15	14
Quite Content							16	14	16	14
Advancer, McLean	15	10	22	4	10	0	25	15	18	7
American Wonder	12	7	19	10	16	0	24	10	28	5¼
Premium Gem	12	7	20	11	19	14	24	4	19	5
Heroine	16	8	9	8	20	14	41	12	22	2½
Lincoln							22	13	22	13
Juno	24	11	19	15	19	12	43	8	26	15½
Stratagem	18	0	3	10	8	8	23	13	13	8
Telephone	19	0	19	7	5	8	28	9	18	2
Gregory Surprise	3	14	18	16	19	2	30	3	17	14
Early Giant	11	13	14	0	12	10	33	8	17	15¾
Nott New Perfection					18	3			18	3

PARSLEY.

Of the two varieties tested, Double Curled and Dwarf Perfection, the latter was the superior.

PENNYROYAL.

Seed was sown on the 20th of June which proved too late as maturity was not reached before frost.

PUMPKIN.

Two varieties were tested, Early Sugar and Connecticut Field. The largest pumpkins produced were ten and twelve pounds respectively though one plant carried through in the hot bed produced fruit weighing practically twenty pounds.

LACOMBE.

RADISH.

Two varieties were tested, the Turnip Early Scarlet White Tipped and Forcing Turnip Scarlet, both of which gave a satisfactory yield, were ready for use at the same time and were about of equal quality.

RHUBARB.

The varieties of rhubarb of highest quality were: Victoria, Linnæus, Early Raspberry, Early Scarlet.

The following table shows the varieties tested, the date in use and the total yield from three hills of each variety:—

Variety.	Ready for Use.		Yield.	
			lb.	oz.
Hobday Giant	June	22	88	4
Early Raspberry	"	25	78	8
Victoria	"	24	68	4
Daws Champion	"	25	68	0
Paragon	"	25	61	0
Linnaeus	"	24	60	8
Prima Donna	"	28	56	0
Early Scarlet	"	28	46	1
Royal Albert	"	30	44	11
Monarque	"	25	38	0
Tolbosk	"	30	36	8
Queen	July	1	15	8
Excelsior	"	1	5	0

TURNIPS.

Of the three varieties of turnips tested in 1914 Early White Flat Strap Leaved gave the largest yield, producing one hundred pounds from a row 30 feet in length. The Variety Favorite followed, with Extra Early White Milan third.

TOMATOES.

Ten varieties of tomatoes were tested. No fruit was fully matured. Those varieties producing the largest green tomatoes are arranged in order: Prosperity, Bonny Best, Earliana, Chalk Early Jewel, XXX Earliest Round Scarlet Skin, Extremely Early I.X.L., Northern Adirondack, Alacrity.

VEGETABLE MARROW.

Several varieties of vegetable marrow produced fruit. The largest total production from three hills was secured from the variety Long Vegetable Marrow (cream trailing) which produced 139 pounds, Long White Bush Marrow producing 112 pounds while several varieties of squash produced fruit, among them being Mammoth Whale, Hubbard and Golden Hubbard.

POTATOES.

Thirty varieties of potatoes were tested at this Station in 1914. The land was ploughed out of timothy and alsike sod in August of 1913, packed, disced and thoroughly worked throughout the fall. Early spring cultivation was given and the potatoes were planted on May 23 and 25 and harvested September 21 and 22.

LACOMBE.

An experiment was conducted with sprouted versus un-sprouted sets. The sets were placed in a box and exposed to the sunlight about ten days before planting. The sprouted sets appeared above the ground and came in bloom one week earlier and continued to show superior vigour and growth throughout the entire season. The yield from the sprouted sets excelled that secured from the unsprouted by more than 50 per cent.

POTATOES—Test of Varieties.

Variety.	Date Planted.	Date Harvest'd	Total Yield per acre.		Percentage marketable.	Percentage non-marketable.	Form and Colour.
			Bush.	lb.			
Morgan Seedling	May 23..	Sept. 21..	365	12	98	2	Long, pink.
King Edward	" 25..	" 22..	363	00	63	37	Half round, white, pink eye.
Irish Cobbler	" 23..	" 21..	360	48	80	20	Round, white.
Money Maker	" 23..	" 21..	360	48	82	18	Long, white.
Table Talk	" 25..	" 22..	354	12	50	50	Round, white.
Epicure	" 25..	" 22..	349	48	90	10	Round, white.
Late Puritan	" 25..	" 22..	343	12	89	11	Half Long, white.
Wee McGregor	" 23..	" 21..	325	36	91	9	Round, white.
Empire State	" 23..	" 21..	323	24	96	4	Long, white.
Gold Coin	" 23..	" 21..	314	36	76	24	Half round, white.
American Wonder	" 23..	" 21..	308	00	90	10	Half long, white.
Rawlings Kidney (Ashleaf Kidney)	" 23..	" 21..	305	48	87	13	Round, white.
Carman No. 1	" 23..	" 21..	286	00	82	18	Half long, white.
British Queen	" 23..	" 21..	286	00	81	19	Half long, white.
Selected Table Talk	" 25..	" 22..	286	00	65	35	Round, white.
Early Norther	" 25..	" 22..	275	00	94	6	Half long, red.
Dreer Standard	" 23..	" 21..	255	12	85	15	Half round, white.
S. African Frost Proof	" 23..	" 21..	250	48	81	19	Half long, red.
King	" 25..	" 21..	248	36	89	11	Half long, white.
Rochester Rose	" 25..	" 22..	248	36	42	58	Half round, pink.
Houlton Rose	" 25..	" 22..	224	24	85	15	Half long, pink.
Holborn Abundance	" 25..	" 22..	224	14	80	20	Round, white.
Country Gentleman	" 25..	" 22..	220	00	74	26	Half long, pink.
Early Hebron	" 25..	" 22..	211	12	76	24	Half long, pink.
Hard to Beat	" 23..	" 21..	182	24	64	36	Half long, white.
New Queen	" 25..	" 22..	158	24	82	18	Half round, pink.
Dalmeny Beauty	" 23..	" 22..	143	00	76	24	Half long, white.
Vick Extra Early	" 25..	" 22..	112	12	72	28	Round, white.

LACOMBE.

FLOWERS.

The following herbaceous perennials have lived through two winters and in nearly every instance have produced bloom:—

Aconitum Napellus albus.
Aconitum Napellus.
Aconitum Lycotonum.
Aconitum Sparks (variety).
Aconitum Stoerkianum.
Anchusa italica (Dropmore variety).
Aquilegia (in variety).
Dictamnus albus.
Dictamnus albus purpurens (Fraxinella).
Dictamnus caucasica.
Dicentra spectabilis.
Dianthus deltoides glaucus.
Dianthus barbatus.
Dracocephalum Ruyschianum.
Delphinium (in variety).
Delphinium cashmirianum.
Geranium sanguineum.
Gypsophila Paniculata.
Gaillardia.
Campanula (8 varieties).
Cimicifuga americana.
Helianthus Daniel Dewar.
Helianthus Miss Mellish.
Helianthus giganteus.
Hemerocallis Gold Dust.
Hesperis matronalis.
Lupines.
Lathyrus albus.
Papaver nudicaule miniatum.
Phalaris arundinacea.
Platycodon grandiflorum.
Papaver orientale Mogul.
Papaver orientale Queen Alexandra.
Polemonium (4 varieties).
Pyrethrum.
Phlox Mrs. Jenkins.
Spiræa astilboides.
Spiræa Filipendula.
Spiræa Ulmaria.
Spiræa Venusta.
Spiræa Aruncus.
Thalictrum (4 varieties).
Veronica spicata.
Veronica Waldsteinii.
Japanese Iris.
Iris sibirica.
Iris sibirica Snow Queen.
German Iris Honorabilis.
" " *Spectabilis.*
" " Lord Salisbury.
" " Madame Chereau.
" " Edith.
" " La Tendresse.

CANNAS.

A collection of partly grown cannas was received on June 16. The weather was not very favourable to their growth and no bloom was obtained.

LACOMBE.

ANNUALS.

The following varieties of annuals were sown in the hotbed on April 22:—

	Bloomed	
	From	To
Asters, 21 varieties	Aug. 16	Oct. 21
Alyssum, Sweet	July 20	" 21
Antirrhinum	Aug. 24	" 21
Bartonia aurea	July 25	" 21
Candytuft	" 8	Nov. 4
Carnation, Marguerite	Aug. 25	Oct. 21
Centranthus Macrosiphon	July 3	" 3
Chrysanthemum, annual	" 25	" 10
Clarkia elegans	Aug. 12	" 10
Cockscomb	" 22	Sept. 1
Coreopsis, annual, 6 varieties	" 15	Oct. 3
Cosmea or Cosmos	July 15	Aug. 17
Dianthus Heddewiggii	Aug. 3	Oct. 31
Dimorphotheca aurantiaca	July 8	" 3
Daisy, double	Aug. 10	" 3
Eschscholtzia	July 25	" 3
Godetia	Aug. 14	" 3
Jacobaea	" 17	" 10
Lavatera rosea	" 3	" 10
Larkspur, 3 varieties	" 22	" 10
Leptosiphon hybridus	July 12	" 10
Linum	" 28	" 3
Lobelia ramosa	" 22	" 3
French Marigold	" 17	" 3
Mignonette	Aug. 5	" 10
Nasturtium, 8 varieties	July 23	Sept. 1
Petunia, 4 varieties	Aug. 14	" 14
Phlox Drummondii, 7 varieties	July 25	Oct. 10
Portulaca	" 25	Sept. 1
Rudbeckia	" 31	" 1
Salvia Fireball	" 21	" 1
Salpiglossis	" 18	" 1
Scabious	Aug. 17	" 14
Schizanthus hybrids	July 12	" 1
Stocks, Ten Week, 6 varieties	" 24	Oct. 10
Swan River Daisy	" 25	" 10
Sweet Sultan	Aug. 3	" 1
Verbena	" 18	" 10
Viscaria cardinalis	July 17	" 10

The following varieties of Everlasting were tested:—

	Bloomed	
	From	To
Acrolinium	July 8	Oct. 10
Ammobium	" 17	" 10
Calendula	" 23	" 21
Helichrysum	" 25	" 10
Xeranthemum	July 29	Oct. 10
Zinnia	" 24	Sept. 1

LACOMBE.

The following varieties of foliage plants were tested with good results: *Kochia trichophylla, Pyrethrum aureum, Amaranthus tricolor splendens, Zea japonica variegata.*

Fifty-four varieties of sweet peas were planted on April 14. The first bloom appeared July 8 and from that date to the close of the season there was a splendid profusion and variety of bloom. The sweet pea is one of the very best flowers for this climate:—

King Edward VII, crimson.
Dorothy Eckford, white self.
Dainty, white edged pink.
Black Knight, dark maroon.
Miss Wilmott, salmon red.,
Mrs. Walter Wright, rosy mauve.
Mrs. Collier, primrose self.
Helen Pierce, grained blue.
Prince of Wales, rosy crimson.
Lord Nelson, dark blue.
Lady Grisel Hamilton, lavender self.
Janet Scott.
Zarina, salmon pink.
Jeannie Gordon, carmine and buff.
Prima Donna, blush pink.
Rose du Barri, rose and orange.
Queen Alexandra, crimson scarlet.
Saint George, orange scarlet.
Charles Foster, pink and mauve.
Asta Ohn, lavender.
America Spencer, rosy scarlet.
Mrs. A. Ireland, rose and blush.
John Ingman, carmine and rose.
Mrs. Hardcastle Sykes, blush pink.
Mrs. Routzahn, apricot cream.
Helen Lewis, orange scarlet.
Nora Unwin, white self.
Nubian, dark maroon.
Flora Norton Spencer, pale blue.
Countess Spencer, pale pink.
Elsie Herbert, white.
Mrs. Cuthbertson, bicolour.
Clara Curtiss, primrose self.
Lady Evelyn Eyre, pink flushed salmon.
Florence Nightingale, lavender.
Mrs. C. W. Breadmore, primrose.
Etta Dyke, white self.
Tennant Spencer, rosy mauve.
Thomas Stevenson, orange scarlet.
Maud Holmes, crimson.
Mrs. R. Hallam, pink cream.
Rosabelle, rose self.
Hercules, rosy pink.
Moonstone, pale lavender grey.
Helen Chetwynd Stapylton, pink on cream.
Princess Mary, blue, slight pink.
Edith Taylor, salmon rose.
Lilian, pink flushed buff.
Cerise Spencer, cerise.
Barbara, salmon orange.
Agricola, lilac blush.
Scarlet Emperor, scarlet self.
Zarina Spencer, salmon pink.
King White, white.

GLADIOLI.

The following varieties of gladioli were planted on the 21st of May and in the majority of cases produced bloom. The season did not permit bloom to continue any length of time as it was frosted September 15. The variety Pink Beauty came earliest into bloom, flowering the 2nd of August: America, Halley, Pink Beauty, Hollandia, Joseph Hulot, Willy Wigman.

PÆONIES.

Twenty-one varieties of pæonies received from A. Dessert, Chenonceaux, France, were planted on the 3rd of November, 1913. The following bloomed last year: *Festiva Maxima,* Madame Emile Galle, Livingstone, Octave Demay.

TULIPS.

Tulips made a brilliant showing in 1914:—

Variety.	Height.	In Bloom.
	In.	
Artus	7	May 21.
Cottage Maid	8	" 19.
Chryslora	9	" 19.
Duchesse de Parma	8	" 19.
Joost van Vondel (red in white)	9	" 19.
Joost van Vondel (white)	10	" 18.
Keizerskroon	11	" 18.
La Reine	10	" 20.
Pottebakker (scarlet)	10	" 20.
Pottebakker (white)	10	" 15.
Proserpine	10	" 17.
Vermilion Brilliant	8	" 19.
EARLY DOUBLES.		
Couronnte d'Or	10	May 19.
Impera or	9	" 19.
Murillo	9	" 20.
Rubrorum	9	" 19.
LATE SINGLES.		
Darwins	16	May 29.
Gesneriana Spathulata	10	" 30.
Isabella	10	" 28.
La Merveille	8	" 29.
La Candeur	14	June 1.
Picotee	12	" 6.
Yellow Rose	8	" 1.

DAFFODILS.

Varieties.	In Bloom
Barri Conspicuus	May 29.
Cynosure	" 29.
Emperor	" 29.
Golden Spur	" 29.
Poeticus	" 29.
Princeps	" 29.
Sir Watkin	" 29.
Victoria	" 29.

A number of ornamental trees and shrubs were planted in different parts of the grounds in the spring of 1914. This planting is now practically complete and the growth already made is greatly improving the appearance of the farm. The bareness of the ground between the Edmonton trail and the Superintendent's residence is disappearing and in a very short time this area will present a changed appearance to that of two or three years ago. A large number of hedges are now being grown with the object of providing material for comparison so that farmers wishing to add beauty to their grounds may be able to select intelligently the varieties of trees suitable for hedge purposes which they consider would meet their conditions best. The hedges of greatest promise at present are: laurel-leaved willow, caragana arborescens, native white spruce, salix daphnoides acutifolia.

LACOMBE.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

The horticultural work was started rather late this spring, as from October 1913, until April, 1914, we did not have anyone in charge of this particular branch of our work.

Early in April, Mr. J. D. Brydon was engaged, and he took charge of the work during the season. The following report contains the results which were obtained by him.

The main work of the season consisted of a somewhat extensive series of variety tests with vegetables, flowers and bush fruits.

The season was a very dry one, and some varieties of fruits, flowers, and vegetables suffered in consequence. However, fair returns were secured as a rule, and dry weather loving plants did better than usual.

During the spring and early summer months, there was a good show of bloom in the herbaceous border, but during July and August many plants did not come to perfection.

The orchard planted in the spring of 1913 has got well established, but only some of the small fruits produced a crop this year.

The winter of 1914-15 up to date of writing has been one of the mildest on record. There has been no snow, and the rainfall has been exceptionally light. Consequently everything is very early. Snowdrops and crocus bloomed as early as the first week in February, and the daffodils, hyacinths, and some of the earlier varieties of tulips were making a splendid show by the third week in March. Flowering cherry, magnolia, and crab apple were also in bloom.

The fine weather enabled a lot of work to be done during the winter, which in ordinary years would have to be left until the spring. This, of course, enables us to give more time and attention to the rest of the work in the garden at the present, when time is so valuable, and given a reasonably fine summer the season promises to be one of the best in the history of the Farm.

PEAS.

Variety.	Date Sown.	Height.		Date ready for use.	Yield per plot Green Peas in pod.	Yield per acre.		
		ft.	in.		lb.	ton.	cwt.	lb..
Juno	April 9	3	4	July 9	32	7	14	88
Dainty Duchess	" 9	3	6	" 1	20	4	16	80
Gregory Surprise	" 9	5	6	June 14	20	4	16	80
Thos. Laxton	" 9	5	6	" 17	19	4	11	96
Stratagem	" 9	2	0	" 26	19	4	11	96
American Wonder	" 9	2	0	" 29	18½	4	9	54
Sutton Excelsior	" 9	2	6	" 20	16	3	17	44
McLean Advancer	" 9	2	0	" 18	15	3	12	60
Gradus	" 9	6	0	" 17	14½	3	10	38
Telephone	" 9	7	0	July 1	12	2	18	08
Premium Gem	" 9	1	5	June 29	12	2	18	08
Heroine	" 9	3	6	July 9	9½	2	5	98
The Lincoln	" 9	2	8	June 28	7	1	13	88
Quite Content	" 20			No germination.				

Fourteen varieties of peas were tried this year, all of them except Quite Content being sown on April 9. This latter gave no results at all, only three or four of the seeds germinating. Juno came out on top in the matter of yield, giving considerably over seven tons to the acre. This was one of the last to come into bearing, and had well filled pods of good, dark green peas.

Gregory Surprise and Dainty Duchess tied for second place, with a yield of about 5 tons to the acre. The latter is a good pea, but the seed was mixed with a taller variety with small peas, which affected the yield to a certain extent. The former, as was the case last year, was the first to come into bearing, and yielded well on into the season. Stratagem, Thos. Laxton and American Wonder gave fair results, but American Wonder did not compare favourably with the others in point of flavour.

ONIONS.

Variety.	Date Sown.	Date Harvested.	Yield per Plot.	
			lb.	oz.
Salzer Great Red	April 11	Oct. 15	12	3
Large Red Wethersfield	" 11	" 15	8	5
Red Globe	" 11	" 15	7	3
Johnston Dark Red Beauty	" 11	" 15	6	6
White Globe	" 11	" 15	6	0
Yellow Globe	" 11	" 15	4	3
Danvers Yellow Globe	" 11	" 15	4	0

Owing to the very dry season and the seed being sown late on rather poor soil, they did not start as well as they might have done.

At the thinning season they were very badly troubled with the maggot, and it was not considered advisable to thin them. They were dressed twice with coal oil and sand in the growing season, in order to check the depredations of the maggot as far as possible, and this remedy had considerable effect. While these did not give the best results as regards yield, we would mention Red Globe, and Red Wethersfield as two very useful varieties of onion, being more uniform in shape and size than the others. Yellow Globe is a good early variety, but does not recommend itself as a good keeper. White Globe is an excellent onion for pickling.

CORN.

Variety.	Date Sown.	Height.		Date ready for use.	Yield per plot of Green Corn on Cob.	Yield per Acre.		
		ft.	in.		lb.	ton.	cwt.	lb.
Perkins Extra Early Market	April 20	8	0	Aug. 20	70	16	18	80
Metropolitan	" 20	7	6	Sept. 5	56	13	11	04
Evergreen Sugar	" 20	7	0	" 5	54	13	1	36
Early Evergreen	" 20	7	0	" 3	52	12	11	68
Pocahontas	" 20	6	0	Aug. 27	50	12	2	00
Early Fordhook	May 18	6	6	" 20	48	11	12	32
Country Gentleman	April 20	7	0	Sept. 6	47	11	7	48
Early Malcolm	" 20	4	0	Aug. 12	45	10	17	80
Extra Early Adams	" 20	5	0	" 10	42	10	3	28
Early Dawn	" 20	5	0	" 14	40	9	13	60
Mexican Black	" 20	7	0	Sept. 2	40	9	13	16
Golden Bantam	" 20	5	6	" 16	38	9	3	92
Squaw Corn	" 20	3	0	" 6	36	8	14	24
Early Iowa	" 20	3	6	" 14	20	4	16	80
Stowell Evergreen Sugar	" 20	7	0	Sept. 13	18	4	7	12

AGASSIZ.

Fifteen varieties of corn were tested and owing to the exceptionally dry season they matured very early, the Squaw corn coming in as early as the 6th August, and most of the other varieties were fit for use before the end of that month. Perkins Extra Early Market proved the heaviest cropper with a yield of nearly 17 tons to the acre. This is a very strong growing corn with large cobs, and comes in fairly early, but does not compare very favourably with several other varieties as regards flavour. Metropolitan came second, and is hard to beat for flavour and yielding qualities combined, though Golden Bantam as usual, takes first place for the former quality. Mexican Black, as its name implies, when properly ripe is black, and as it is of a very sweet flavour is a rather popular variety, apart from the interest attaching to it from its peculiar colour. Country Gentleman is another corn that can be recommended for its table qualities.

TOMATOES.

Variety.	Date sown.	Date ready for use.	Weight of five average hills.		Yield per acre.		
			lb.	oz.	tons	cwt.	lb.
Florida Special	March 30	August 12	53	8	14	1	30
Burpee Whole Salad	" 30	" 15	44	0	11	19	58
Chalk Early Jewel	" 30	" 12	43	8	11	16	84
Prosperity	" 30	" 7	41	0	11	3	26
Sunnybrook Strain Earliana	" 30	" 7	36	7	9	18	74
Alacrity	" 30	" 7	33	0	8	19	68
Rennie XXX	" 30	" 7	30	3	8	4	71
Bonny Best	" 30	" 7	26	12	7	5	65
Johnston Jack Rose	" 30	" 7	24	8	6	13	40
I.X.L.	" 30	" 10	22	8	6	2	52
Northern Adirondack	" 30	" 7	19	4	5	4	81

This test included eleven varieties, which were all sown on 30th March in a hotbed, and from there transplanted as they were ready into 2 inch. 4 inch. and 7 inch. pots, and from the latter transferred into the garden.

They were grown on the one stem system, staked, kept reasonably pruned, and the weights were obtained from five average plants.

Florida Special was the heaviest cropper, but this yields a rather coarse fruit, with a very large deep eye. Burpee Whole Salad came second, and this was by far the best tomato in the trials. It is a heavy bearer of well shaped, firm and fleshy tomatoes with the joints very close, and is a variety that should be grown more extensively, being well adapted to the climate in that it does not seem so liable to rot as do many of the other kinds when the weather is damp. Chalk Early Jewel and Prosperity also yielded well, but the former does not adapt itself well to the climate, as it commences to rot before the fruit is ripe, and half the fruit has to be cut away before it can be used.

BEETS.

Variety.	Date Sown.	Date ready for Use.	Yield per Plot.	Yield per Acre.
			lb.	ton. cwt. lb.
Cardinal Globe	May 15	August 20	54	15 13 74
Early Blood Red	" 15	" 20	36	10 9 16
Eclipse	" 15	" 20	36	10 9 16
Egyptian Dark Red Flat	" 15	" 20	35	10 3 35
New Meteor	" 15	" 20	35	10 3 35
Ruby Dulcet	" 15	" 20	33	9 11 73
New Black Ball	" 15	" 20	29	8 8 49

Out of the seven varieties of beet which were tried Cardinal Globe stands out from the rest both for quality and yield. It has a nice clean skin, and the roots are of good uniform shape. It could do with a little selecting. Early Blood Red and Eclipse tied for second place in point of yield, but of these two Early Blood Red was easily the better, Eclipse being very coarse, and, in fact, the poorest beet in the trials as regards quality. The seed both of Ruby Dulcet and New Black Ball was not true to type, some of the leaves being green, and some red.

CARROTS.

Variety.	Date Sown.	Date ready for Use.	Yield per Plot.	Yield per Acre.
			lb.	tons cwt. lb.
Nantes Early Half Long Scarlet	April 9	July 10	82	23 16 42
Half Long Chantenay	" 9	" 10	68	19 15 08

Only two varieties of carrot were tested this year, and both gave very good results. They were first ready for use on the 10th July, and the last of them were harvested on the 15th October. Nantes Early Half Long Scarlet came first with an exceptionally heavy yield of nearly 24 tons to the acre. Both varieties were good table carrots.

BEANS.

Variety.	Date Sown.	Date Ready for Use.	Yield per plot of Green Beans.	Yield per acre.
			lb.	tons cwt. lb.
Grennell Rustless Wax	May 7	July 13	19½	5 13 30
Extra Early Refuge	" 7	" 14	18	5 4 58
Refugee or 1,000 to 1	" 7	" 10	18	5 4 58
Wardwell Kidney Wax	" 7	" 7	17½	5 1 68
Golden Wax	" 7	" 17	15	4 7 15
Bountiful Green Bush	" 7	" 13	15	4 7 15
New White Seeded Stringless Green Pod	" 7	" 16	12	3 9 72
Valentine Wax	" 7	" 11	11½	3 6 82
Extra Early Valentine	" 7	" 16	9	2 12 29

AGASSIZ.

Four green and three wax varieties of beans were grown, and of these Grennell Rustless Wax was the best, not only being the heaviest cropper, but maturing quickly. It also gave the best satisfaction for table use. Extra Early Refuge, Refugee or 1,000 to 1, and Wardwell Kidney Wax also did well. The beans were planted in rows 30 inches apart, and plants were two inches apart in the rows.

LETTUCE.

Variety.	Date Sown.	Date ready for for Use.	Yield per Plot.
			lb.
Drumhead Wonder	April 7	July 7	48
Dark Green Capucine	" 7	" 10	37½
Grand Rapids	" 7	" 4	35
Simpson Black Seeded	" 7	" 4	35
Iceberg	" 7	" 9	30
Giant Crystal Head	" 7	" 10	22½
Hanson Improved	" 7	" 6	22½
Unrivalled Summer	" 7	" 10	12
Dreer All Heart	" 7	" 10	7½
Russian Blond Winter	" 7	" 28	Ran to seed.
Red Edged Victoria	" 7	" 1	Ran to seed.

Of the eleven varieties of lettuce tested two were practically a total failure, bolting to seed as soon as ready. These were Russian Blond Winter and Red Edged Victoria. On account of the dry season the lettuce was late in maturing, not being ready before July 4. Drumhead Wonder was at the head of the list, and is one of the best lettuce, being a good size, with a nice firm heart. Giant Green Capucine came second, and is a cos variety with dark green foliage. It is rather inclined to throw its inside leaves out instead of closing.

Grand Rapids yielded well, but did not make a very good heart. Iceberg is a small variety that can be well recommended.

RADISH.

Variety.	Date sown.	Date ready for use.	Yield per plot.
			lb.
Forcing Turnip Scarlet	June 12	July 5	11
Early Scarlet White Tip	" 12	" 3	9

Only two varieties of radish were tried, and there was very little difference either in the yield or the time taken to mature. The maggot is very prevalent in this district, and as an experiment one variety was sown under cheesecloth and the other in the open. Either owing to the drought or to the late planting the maggot gave very little trouble, but the variety under cover yielded a slightly heavier crop.

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TURNIPS.

Variety.	Date sown.	Date ready for use.	Yield per plot.		Yield per acre.		
			lb.	oz.	ton.	cwt.	lb.
Extra Early White Milan............	June 12	July 20	18	0	10	9	16
Early White Flat Strap Leaved......	" 12	" 20	15	4	8	17	20

The two varieties of turnips were sown in rows 30 feet long, and 15 inches between the rows, and plants were thinned out to 2 inches in the rows. Extra Early White Milan gave the heaviest yield, and is an extra good variety with good clean bulbs, and flesh of fine texture.

PARSNIPS.

Variety.	Date sown.	Date ready for use.	Yield per plot.
Intermediate..............................	April 9	Sept. 14	72 lb.
Improved Hollow Crown..............................	" 9	" 14	51 "

Of the two varieties of parsnip grown Intermediate was the better, not only yielding well, but having clean roots of a good uniform shape and size. They were grown in rows 30 feet long and 30 inches apart, and plants were thinned to 2 inches apart in the rows. On the whole the yield was not up to the average.

PARSLEY.

Double Curled was the only variety of parsley tried. This is a fine variety with leaves of a dark green colour, but it would bear with a little selecting. This was sown on April 9, and was ready for use on June 23.

SALSIFY.

Only one variety of salsify was tried, viz., Long White. This was planted on April 9, and was ready for use September 1. Its merits can only be regarded as fair, most of the plants having a great number of fibrous roots. Twenty-six pounds were harvested altogether.

MARROWS.

Variety.	Date sown.	Date ready for use.	Yield taken from 3 hills.
			lb.
Cream Trailing..............................	April 23	July 14	537
Mammoth Whale..............................	" 23	" 25	447
Custard White Bush Scalloped....................	" 23	" 10	172
Long White..............................	" 23	" 10	161½
Delicata..............................	" 23	Aug. 21	120
White Congo..............................	" 23	July 21	105

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The six varieties of marrows were sown on April 23, in hills 9 feet apart each way, and a first-rate crop was obtained. From weights taken from three hills Cream Trailing proved to be leader with a yield of 358 pounds. This is a cream coloured marrow of good uniform shape and size, and owing to its strong growth should be given plenty of room to develop. Though Mammoth Whale was second on the list this is not a variety that is recommended for table use, as it is too coarse, some of the fruit weighing as high as 40 pounds. Custard White Bush Scalloped are interesting as varieties from their peculiar shape, but are not recommended from a commercial point of view.

SQUASH.

Variety.	Date sown.	Date ready for use.	Yield taken from 3 hills.
			lb.
Hubbard	April 23	July 18	270
Golden Hubbard	" 23	" 24	196
Summer Crookneck	" 23	" 10	108
Delicious	" 23	" 20	93

These were planted the same way as the marrows, 9 feet apart, and the weight was taken from three hills Hubbard gave the best satisfaction, and yielded 270 pounds of fruit, and Golden Hubbard did far better than last year, coming second with a yield of 196 pounds. Summer Crookneck is an interesting variety, and has fruit of an ochre colour covered with encrustations of a warty appearance. It is not, however, much good for practical purposes owing to its unusual shape.

PUMPKINS.

Variety.	Date sown.	Date ready for use.	Yield taken from 3 hills.
			lb.
Connecticut Field	April 23	Aug. 21	261
Early Sugar	" 23	" 28	121

The two varieties of pumpkin grown were very similar in general characteristics, except that the fruit of Connecticut Field was much larger, averaging 18 to 20 pounds each, as against 5 to 7 pounds each of Early Sugar. There was very little difference in the time taken to mature, both being ready about the last week in August.

CUCUMBERS.

Variety.	Date sown.	Date ready for use.	Yield taken from 3 hills.	
			lb.	oz.
Peerless or Improved White Spine	May 3	Aug. 27	46	0
Extra Early Russian	" 3	" 27	26	0
Prize Pickling	" 3	Sept. 5	22	2
Giant Pera	" 3	Aug. 23	19	1
Cool and Crisp	" 3	July 30	7	4

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Six varieties of cucumber were planted in hills 6 feet apart each way, and the yield was calculated from three hills.

The first variety to come into bearing was Cool and Crisp which was ready as early as July 30. Extra Early Russian, Giant Pera and Peerless or Improved White Spine were only three weeks later, but Prize Pickling was very late, not maturing before the first week in September. Both Extra Early Russian and Cool and Crisp are short stumpy cucumbers, but the latter is a poor yielder. Peerless or Improved White Spine provided the heaviest crop, and this is the best cucumber for market purposes, growing from 12 inches to 14 inches long, with fruit of good shape. Giant Pera is also a good shaped cucumber and a fair cropper.

MELONS.

Two varieties of melon of the cantaloupe type were tested this season. They were planted on April 6, and were ready for use on September 21. Salzer Earliest Ripe bore a quantity of fruit, but they did not grow to a very good size. Thirty-seven pounds of fruit were gathered from 3 plants. The other melon sown was a French variety, and although the actual weight of the yield was not as high, the fruit averaged more, one weighing over 6 pounds. This melon yielded 33 pounds of fruit.

CITRONS.

Sixty-five pounds of fruit were gathered off three hills of the one variety of citron planted. They were sown on the 11th April, and the first picking was made on the 6th August. They did exceptionally well, no doubt on account of the dry sunny weather experienced during the season.

SMALL FRUITS.

Of the small fruits, strawberries, blackberries and raspberries did reasonably well. Currants, both red and black, produced no fruit but made strong growth, and show promise of a good crop next season. Gooseberries made a poor showing, the growth being weak and the plants attacked with mildew.

STRAWBERRIES.

Of the three varieties of strawberries, Magoon, Sharpless and Paxton, the two first did well, but the third was a practical failure. This variety came into bearing late and the birds got most of the fruit. Following are given the respective periods of fruiting and amount of fruit.

Variety.	Period of fruiting.	Amount of fruit.
		lb.
Magoon	July 3 to July 28	31
Sharpless	" 3 to " 28	29
Paxton	" 9 to " 29	8

GOOSEBERRIES.

None of the varieties fruited this season, the growth in most cases being weak. The mildew was partly responsible for these poor results.

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CURRANTS.

These made strong growth. The abundance of fruit spurs and buds gives promise of a good crop in the coming season, both in the red and black varieties. Among the black currants, the strongest growers were Boskoop Giant and Victoria.

BLACKBERRIES.

Of the varieties planted Snyder gave very good results for the first year, yielding some 16¼ pounds of fruit; fruiting lasted from July 16 to August 6. With the Erie variety no fruit was produced but strong growth was made and there are indications of a good crop next season.

Evergreen fruited well, the amount gathered being 12 pounds 13 ounces. This variety is particularly useful as it comes into bearing when the other varieties are over for the season.

Logan-berries gave 8 pounds 1 ounce of fruit. The berries were ready on June 28. The results are very good, when it is considered that the canes have been planted only 10 months. Owing to the close planting and the rank growth of the canes, it was found necessary to thin out to a distance of six yards.

RASPBERRIES.

The best variety of raspberry was the Cuthbert, which produced a good crop of medium-sized berries. Fruiting lasted from July 2, when the berries were ready, until August 7, and 40 pounds of fruit were taken altogether. On account of its firmness this variety is particularly valuable for shipping.

Golden Queen gave 11½ pounds from July 3 to August 7, but the berry is not suitable for shipping, being too soft.

Three varieties, Fillbasket, Superlative and Herbert, did not produce any fruit. Of these Fillbasket made extra strong canes, but the other two varieties were very poor.

ORCHARD.

An orchard containing apples, pears, plums, and cherries, planted in the spring of 1913, has, of course, not yet come into bearing. Most of the trees have made good growth, however, and are in good condition.

FLOWERS.

SWEET PEAS.

Two types of sweet pea were grown, the *Grandiflora* and the Waved type. Of the former eighteen varieties were tried, and of the latter thirty-nine, making a total of fifty-seven in all. In these trials the Maud Holmes (crimson) was the best of all and the King proved the best white pea. Other good varieties were Queen Alexandra, Lady Grisel Hamilton, Thos. Stevenson, and Florence Nightingale.

Below is given a list of the varieties used, with notes on colour, growth, etc.

	Colour.	Remarks.
Grandiflora Types.		
Dorothy Eckford	White self	Strong grower and free flowerer.
Dainty	White, pink edge	Colour more definite at the back. 2 or 3 purple seeded ones.
Mrs. Collier	Yellow	An older variety. Germinated badly, weak growth.
Prima Donna	Pale self soft pink	
Janet Scott	Pale salmon pink.	
Czarina	Soft salmon pink	A good variety.
Jeannie Gordon	Carmine pink, cream wings.	
St. George	Bright orange scarlet	Slightly waved. This variety burns with the sun.
Miss Wilmott	Salmon red	Good variety, large flower.
Prince of Wales	White, with blue stripe	Poor variety.
Queen Alexandra	Light crimson scarlet self	Very good variety.
King Edward VII	Crimson self.	
Rose du Barri	Rose, slightly flushed with orange.	
Mrs. Walter Wright	Mauve.	
Lady Grisel Hamilton	Lavender self	Very good, popular variety.
Helen Pierce	White, blue mottled	A good pea.
Lord Nelson	Dark purple self.	
Black Knight	Dark maroon, shaded purple.	
Waved Types.		
Nora Unwin	White	Good variety, large flowers.
Mrs. Routzahn	Buff with pink shading.	
Mrs. Hardcastle Sykes	A pale pink Countess Spencer.	
Mrs. A. Ireland	Bright rose pink standard with blushed wings on a pale cream ground.	
Chas. Foster	Pink and mauve	Large flowers.
America Spencer		A flaked variety.
Flora Norton	Pale blue.	
Asta Ohn	Lavender flushed with pink	A good lavender variety.
Nubian	Chocolate self.	
Etta Dyke (primrose)	Primrose	A good variety but did poorly here.
Mrs. R. Hallam	Deep pink on cream ground	Strong grower.
Rosabella	Rose self	A fine rose variety.
Tennant Spencer	Rose mauve	A fine colour.
Maud Holmes	Crimson (sun proof)	Large flowers; best variety tried.
Thos. Stevenson	Bright orange scarlet, wings lighter	Good variety, sun proof.
Florence Nightingale	Rich lavender, slightly shaded with pink	Very fine pea.
Lady Evelyn Eyre	Pale pink shaded with salmon.	
Elsie Herbert	Creamy white, edged with pink.	Very badly mixed.
Mrs. C. W. Breadmore	Buff, edged with pink.	
Mrs. Cuthbertson	Rose pink with paler wings	Strong grower.
King	White self	Best white variety.
Helen Chetwynd Stapylton	Pale pink on deep cream ground	
Hercules	Rose pink, deeper colour at edges.	
Lilian	Pale pink, flushed with buff.	
Czarina	Salmon pink.	
Barbara	Salmon orange self	Large flower.
Edith Taylor	Rosy cerise.	
Cerise Spencer	Bright cerise	Very nearly sun-proof.
Scarlet Emperor	Scarlet self	Strong grower, sun-proof.
Agricola	Lilac blush.	
Moonstone	Pale lavender, lilac tinge	Very sweet scented.
Princess Mary	Pale blue, flush of pink on standard.	Strong grower.
Constance Oliver		
Evelyn Beauty	Rich pink on cream ground.	
Mrs. Hugh Dixon	Creamy pink.	
Etta Dyke	White	Very good white variety.
Clara Curtis	Primrose	Good.
Edrom Beauty	Orange and rose.	

GLADIOLI.

All the gladioli flowered well but owing to the dry season they did not last long in bloom. Most of the varieties, however, made nice flowering bulbs and corms for another year.

Notes on Varieties.

Variety.	Date of flowering.	Remarks.
Halley	July 7	Pink with fine spike.
Lily Lilimum	" 27	White with a tinge of yellow and pink at the throat.
Hollandis	Aug. 8	Large salmon yellow flowers, lined slightly with red, striped inside, extra fine.
Commandant Martel	July 28	A dark pink and free flowerer.
Willie Wagman	" 28	A Lemoine variety white flushed with pink, with a dark throat.
J. H. Veitch	" 29	A mottled rose purple.
Pink Beauty	" 1	A salmon pink with a very dark red throat.
Joseph Hutol	Aug. 1	A very dark purple blue and a good spike.
Glory of Holland	Sept. 4	A delicate apricot colour, very pretty, but not a very large flower spike.
America	July 6	A beautiful flesh pink of good substance. Large flower.
Princeps		This variety was not true to name. A poor scarlet variety tinged with gold, instead of being a bright scarlet with very large flowers, extra fine.

ANNUAL FLOWERS.

The following annual seeds were sown outside in the herbaceous border in positions where they were to flower. Most of them did well, but owing to the very dry season in June, July and August, the flowering period was short.

Alyssum, sweet.
Balsam, mixed colours.
Bartonia aurea.
Candytuft, mixed.
Centranthus macrosiphon.
Chrysanthemum, annual, special mixed.
Clarkia elegans, special mixed.
Coreopsis in varieties.
Cosmea mixed.
Dimorphotheca hybrids.
Eschscholtzia, mixed.
Godetia in varieties.
Jacobæa, double mixed.
Larkspurs in varieties.
Lavaterea rosea splendens.
Leptosiphon hybrids.
Linum grandiflorum rubrum.
Lupinus, annual mixed.
Mignonette, sweet scented.
Nasturtiums, in variety.
Portulaca, improved double mixed.
Scabiosa, large flowering mixed.
Brachycome iberidifolia, mixed. (Swan river daisy.)
Sweet sultan, mixed.
Viscaria cardinalis.

Several other flower seeds were sown in rows outside and others in boxes in the hotbeds. These were pricked off.

Dahlias.—There is only a very limited collection of these here, some nine varieties of the old fashioned decorative type and two varieties of cactus. These flowered very well from the end of June right up to the end of October.

FLOWERING SHRUBS.

On account of the mild, dry autumn and winter of 1913, the trees and shrubs ripened early and flowered profusely in spring and summer. Since the majority flowered before July, they were not seriously affected by the dry spell. Among the

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shrubs the kinds to be specially noted were: Azaleas, rhododendrons, kalmia, forsythia, ceanothus, deutzia, berberis, ligustrum, magnolias, pyrus japonica, kerria, lilac, hydrangeas, etc. Of the deciduous trees those giving the best display were: cornus, ornamental flowered cherries, limes, laburnums, acacia, tulip tree, maples, ornamental crabs, chestnuts (scarlet and horse), and mountain ash.

Following are some individual notes on the various trees and shrubs in the garden:—

Azaleas.—The varieties planted here are *mollis, pontica* and Ghent. These flower freely and make a great show in the spring months. Some of the Ghent varieties which were imported two years ago are doing excellently, being well set with buds.

Berberis.—Two varieties are grown, *vulgaris* and *Aquifolium*. *Vulgaris* is a hardy plant with small yellow flowers, but owing to the moist climate of this district, it is apt to get mossy. *Aquifolium* is an evergreen variety with large spikes or plumes of yellow flowers to which the bees are very partial. This shrub produces a purple berry.

Colutea arborescens (*Bladder senna*).—Flowers slightly resembling laburnum, followed by curious inflated seed-pods, which hang for a long time. Very suitable for planting on dry banks and poor soil.

Ceanothus.—Several varieties were planted in the spring of 1913 and this autumn they all flowered freely and retained their bloom longer than any other shrub.

Cornus alba sibirica elegantissima.—A silver variegated form, most effective.

Cornus alba sibirica mascula (*dogwood*) *foliis variegata.*—This is often grown as a standard, and planted among other dark shrubs shows up well.

Corchorus (*kerria*) *Japonica flore pleno.*—A very pretty double yellow free flowering shrub, which comes out in May and June.

Pyrus (Cydonia) japonica (Japanese quince).—One of the earliest. Bright scarlet flowers which appear before the foliage.

Daphne Mezereum alba.——Comes into flower early in February. Quite leafless, but covered with a wreath of small fragrant white flowers.

Diervilla (weigelia) florida.—Pink blossoms. A strong grower and flowers freely.

Diervilla (weigelia) Eva Rathke.—A very beautiful, deep-coloured variety. Flowers dark red.

Diervilla (weigelia) Looymansii aurea.—Variegated golden foliage and very abundant rose-coloured flowers.

Deutzia crenata flore pleno.—Double rose-coloured flowers. Blooms in June and July.

Deutzia candidissima plena.—A double white form of the above.

Forsythia suspensa.—Flowers in the spring. Yellow, bell-shaped blossoms. A good pendulous shrub.

Forsythia intermedia.—Bright yellow flowers, which appear in April. More of the bush form than the suspensa.

Halesia tetraptera.—Snowdrop or silver bell tree. Flowers snow white, produced in great profusion, resembling snowdrops.

Hibiscus (Althæa frutex).—Several of these were planted in the spring, but have not flowered yet.

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Hydrangea paniculata grandiflora.—This is one of the most beautiful of all our flowering shrubs, producing great drooping panicles of white flowers, which turn a faint pink as they grow older. Requires close pruning, since it is from the young growths that the flowers are produced.

Hydrangea hortensis rosea.—Beautiful shrub with immense heads of pink flowers. In the winter the *hortensis* varieties require slight protection There are several other varieties of the *hortensis* which were planted last spring. They did not bloom, but have made good growths.

Hydrangea arborescens grandiflora.—A new white variety, a distinct habit. This flowered the first year.

Magnolia.—There are several fine specimens of these to be found here. Amongst the notable ones are: *Conspicua* (a very fine shrub), *Lennei obovata, Soulangeana,* and *tripetala* (umbrella magnolia)

Philadelphus (mock orange).—This is to be found wild here. There are some large plants of the named varieties on the farm, but they are in very poor condition. Some young, named varieties were planted twelve months ago, and are doing well, but they have not yet flowered.

Spiræa japonica, Anthony Waterer.—A splendid dwarf growing variety, covered with deep crimson flowers which keep their bloom a long time.

Spiræa aurea.—A golden-leaved variety with a small white flower.

Spiræa Thunbergii.—A dwarf variety with small white flowers almost covering the branches.

Spiræa Van Houttei.—A very similar variety, but taller than Thunbergii.

Kalmia latifolia (mountain laurel).—The first of all the American peat-loving plants. Every garden should possess this beautiful flowering evergreen, bearing dense clusters of beautiful pink, wax-like flowers in the months of June and July. It is very hardy.

Rhododendron, hybrids and named varieties.—Two years ago several of these were imported and this last summer they have made good growths, considering they had to be watered several times during the very dry spell. Most of them are well set with buds for the coming season. Several varieties flowered last season. The old plants that have been here for some years all flowered well, also the pontica varieties in the months of May and June.

Syringa (lilac).—*Charles X.,* single deep purple and fine truss; *Madame Lemoine,* double compact spike of pure white; *President Grevy,* double blue shaded rose, large; *Soeur de Louis,* single large bright purple, not only in bud but when quite open.

All the above lilacs do well here, and flower very freely in the month of May, but they would be improved if planted in richer soil.

Viburnum Opulus (Guelder rose).—Produced coral red berries in the autumn.

Viburnum Opulus sterile (Snowball tree).—A beautiful flowering shrub with large globular double white flowers; this makes a fine show in May.

Agassiz.

ROSES.

During the whole summer the roses flowered very well, and considering that they were planted only this spring, most of the varieties made good growth. The following varieties did the best:—

Caroline Testout.
Gruss an Teplitz.
Dean Hole.
Betty.
Capt. Christy.
Mad. Cochet.
Dorothy Page Roberts.
Mrs. Aaron Ward.
Mrs. J. Laing.
Ulrich Brunner.
Killarney.
La France.
Mad. Abel Chatenay.
Hugh Dickson.
Mad. Ravary.
La Progres.
A. K. Williams.
Frau Karl Druschki.

TREES AND SHRUBS (EVERGREEN AND DECIDUOUS).

Pinus Cembra (Swiss stone pine).—A very distinct species of conical growth.

Pinus Strobus (Weymouth pine).—Very hardy and likes a deep moist porous soil; there are some fine specimens of this pine here.

Pinus inops.—This is a very spreading tree about 12 feet through and the same in height. Its chief characteristics are a very branching form and short needles. It produces a great quantity of cones.

Pinus resinosa.—This pine does well out here and this last season has made growths of from 12 to 18 inches. Its habit of growth is compact and more upright than that of the Austrian pine. The needles are also longer than the Austrian and more of a glaucous nature.

Pinus Jeffreyi.—Very distinct, and should have a position in every pinetum.

Pinus sylvestris (Scotch fir).—This pine does well here and makes a stately tree. Some are 40 to 50 feet high.

Abies amabilis (syn. Picea amabilis).—Considered the most ornamental of all the silver firs. It has dark, glossy green leaves, glaucous underneath, and thickly set on the branches.

Abies Nordmanniana (syn. Picea Nordmanniana).—A very handsome tree with large spreading branches. This should be extensively planted, especially as a specimen tree.

Abies concolor (syn. Picea concolor).—A very fine evergreen of a glaucous nature.

Abies concolor var. *violacea*.—A beautiful fir, with glaucous leaves. One of the finest of the silver firs. Being thoroughly hardy it is a decided acquisition.

Picea Mariana (syn. Picea nigra) (black spruce).—A highly ornamental tree, close, compact and a slow grower. Suitable for damp situation and can be closely planted for a windbreak.

Picea canadensis (hemlock spruce).—Has a graceful drooping habit, small leaf, glaucous on under side. Requires a moist situation. Well worth a prominent position in the pleasure grounds.

Picea pungens glauca (Blue spruce).—A lovely spruce with glaucous leaves.

Ilex Aquifolium (Common holly).—This does well here, and berries were to be found on some of the plants this winter.

Ilex Aquifolium Hodginsii.—One of the best broad-leaved varieties.

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Ilex Aquifolium argentea marginata.—A broad-leaved silver variety. Free grower and hardy.

Ilex Aquifolium ferox (Hedgehog holly).—A very indented variety with curly leaves.

Ilex Aquifolium argentea lucida (Silver Queen).—A silver variety of the above form. It is very slow growing here, and it is planted on gravelly soil.

Pinus austriaca (Austrian pine).—Like *P. sylvestris* this is another pine that is doing well here on gravelly soil. It makes a good shelter tree.

Sequoia gigantea (*Wellingtonia*), Mammoth tree.—This does not do well here, on account of the cold North winds but where it is sheltered it grows better. In favourable positions the Wellingtonia attains a great height.

Taxus (Yew).—There are six varieties of yews on this farm, viz., *baccata, adpressa, erecta, fastigiata, Barroni, and aurea.* All of these seem to be thriving well.

Thuya occidentalis (American arbor vitæ).—A fast growing shrub which is much used for hedging.

Thuya occidentalis globosa compacta.—Very similar to *occidentalis* but instead of growing erect, it is of a globular shape.

Thuya occidentalis erecta viridis.—A compact upright growing variety. The specimens here are 25 to 30 feet high.

Thuya occidentalis lutea (Golden arbor vitae).—Nice golden colour and fairly hardy.

Thuya occidentalis Little Gem.—One of the dwarf green varieties.

Cupressus Lawsoniana (Lawson Cypress).—A very strong growing green variety which stands the cold very well and also the winds.

Cupressus Lawsoniana lutea.—A beautiful form of the Lawson cypress; is constant in colour and perfectly hardy, one of the most effective garden plants.

Cedrus atlantica glauca. This is a lovely evergreen tree with glaucous foliage, but needs protection from winds.

Araucaria imbricata (Chati pine or Monkey Puzzle).—This is a most distinct tree. It should be planted in a sheltered position.

Taxodium distichum (Deciduous cypress).—Very ornamental with light feathery foliage, changing to rich brown in the Autumn.

Acer (Maple).—There are several varieties of these on this farm, the most prominent varieties being *pseudo-platanus* and *pseudo-purpurea.* These two varieties are planted at either side of the drive and are very much admired.

Other varieties of note are: *campestre* (English variety), *colchicum rubrum, platanoides* (Norway Maple), *platanoides Drummondii,* a handsome silver margined variety, *Pseudo Leopoldii, Pennsylvanicum* (striatum), (Snaked barked), *Negundo foliis variegata,* a fine silver variegated variety, but rather too much moss on it in this district. *Negundo foliis argentea,* a golden variety of the above. It is perfectly clean from moss.

Several varieties of the Japanese or Palmatum varieties have attained a large size, the most prominent varieties being: *atropurpurea, palmatum, aurea maculata, rosea marginata, Osakuzukii, septemlobum purpureum septemlobum tricolor.*

The Japanese or Palmatum varieties are very subject to attack from fungi and mosses, unless sprayed every year.

Robinia.—Of this large family, there are two varieties to be found here

Robinia Pseud-acacia (locust tree) which is very fine when in bloom, but is a very free seeder and if not kept in check is liable to cause trouble.

Robinia Pseudo-inermis, the Mop-headed variety forms a compact head. This tree should be planted in a sheltered position, as the wood is so brittle the branches are apt to break.

Ash (*Fraxinus*).—There are no specimens of the common variety here, but there are several species named below. They are all doing well with the exception of *excelsior concavaefolius foliis variegatis.* The other varieties to be found are: *excelsior laciniata, excelsior aurea,* golden barked variety, *excelsior aurea pendula.*

Beech *(Fagus).—Fagus sylvatica laciniata* (Fern or cut-leaved).—Several fine specimens of this variety are to be found here.

Fagus sylvatica purpurea pendula. For a specimen tree on a lawn this is a tree that can well be recommended, but to show its true character it should be planted away from other trees.

Fagus sylvatica purpurea.—This is one of the first of all our ornamental trees, and will stand the severe winter and winds.

Fagus sylvatica purpurea tricolor.—A purple leaved variety bordered with delicate rose.

Birch *(Betula).*—A most graceful tree at any season of the year.

Betula alba pendula.—A drooping form. This makes a fine specimen tree for a lawn.

Betula alba purpurea.—Rich dark purple leaves, graceful habit and highly ornamental with its silver stem.

Chestnut, Horse (Aesculus Hippocastanum).—A very handsome flowering tree, splendid for exposed situations. Requires fairly good land.

Chestnut, Spanish (Aesculus vulgaris).—There are several varieties of these in the poultry yards, but some of them were diseased and were taken out this fall. The timber of this tree is most valuable for its durability.

Chestnut, Scarlet Horse (Aesculus carnea).—A scarlet variety. This makes a fine specimen tree for parks, avenues, boulevards or hedge-rows.

Cherry (Cerasus).

Prunus (Cerasus) Sieboldii alba fl. pl.—This is a beautiful tree when out in flower in the month of May.

Prunus (Cerasus) vulgaris alba, fl. pl.—Another form of the above, but this variety flowers earlier.

Prunus (Cerasus) Wateriana.—This is a double pink variety, and when out in bloom is a fine sight. The finest of the pink varieties is J. H. Veitch, which has larger flowers than the above.

Colutea arborescens (Bladder senna).

Cornus florida.—A handsome free growing dogwood bearing large creamy white flowers, two inches across. The foliage in the autumn turns a beautiful deep shade of crimson and remains on the tree for a long time, making a fine contrast.

Cornus florida pendula.—A weeping variety of the above.

Cornus florida rosea.—The same as florida, but a pink variety, and the foliage in the autumn is, if anything, a finer crimson.

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Corylus (Hazel).

Corylus Avellana.—On this farm there are several of the European fruiting varieties, and they all bear well.

Corylus Avellana atropurpurea (Purple-leaved filbert).—Makes a very attractive bush all the summer. Any one making a shrubbery should include this, as it is most showy.

Elm, English *(Ulmus campestris).*—This is a tall and elegant tree of rapid and erect growth on good well drained soil. At either side of the entrance to the farm, there will be noticed a stately row of them.

Hickory *(Carya).*—This is a fine stately tree and in spite of the damp climate it keeps free from moss. It also fruits very freely. A valuable tree for its timber.

Halesia tetraptera (Snowdrop or silver bell tree).—Flowers, snow-white, produced in great profusion, resembling snowdrops.

Laburnum (Cytisus vulgaris).—There are two varieties grown here, the common variety and the vossia. The latter has flower spikes from fifteen to eighteen inches long. This is the finest of all the laburnums.

Larch (*Larix Europaea*).—This is a most valuable timber tree, but it does not grow to such a size nor as rapidly as in its native climate.

Pseudo-Larix Kaempferi.—The golden Chinese larch, very similar in the stem to the Japanese variety.

Medlar.—A slow growing tree with white flowers, which come out in June and bear fruit which is ready in October.

Mulberry sp.—Owing to the poor soil the tree is in, it produced very little fruit which was ready in the month of August.

Mulberry, *Morus alba pendula.*—A weeping variety which also did not bear much fruit.

Quercus (Oak).—Several varieties are to be found here and all seem to do well. Amongst them are to be noticed:—

Cerris (Turkey Oak).

Cerris foliis argentea (silver variegation).

Coccinea, the scarlet oak, a very fine variety, the leaves of which turn bright scarlet in the autumn. This is one of the American varieties.

Lime (Tilia).—These do well here and are very useful as a bee food, when in flower in the months of July and August. The varieties on the Farm are: *Europaea, Americana, Alba,* and *Red twigged.*

Gymocladus canadensis (Kentucky coffee tree).—This does not seem to grow very fast here, but is of interest, with its large handsome foliage.

Alder (Alnus).—Alnus glutinosa imperialis (Cut leaved variety).

Salix (Willow).—*Vitellina* (Yellow osier).—This forms a very ornamental tree and a fast grower. In the winter time, both this and the scarlet-barked variety have a very bright and pleasant effect.

Pyrus malus atrosanguinea.—This flowered very freely in the latter part of April and in early May, but the trees are not in extra good health.

Poplar, Lombardy *(Populus nigra var. pyramidalis).*—A very ornamental, upright growing tree. A most useful tree for close planting to act as a block.

Plane, *Platanus acerfolia (London plane)*.—This is a splendid variety for avenue and street planting. It also makes a fine shade tree.

Tulip tree (*Lirondendron tulipifera*).—A very ornamental tree with large saddle-shaped leaves and tulip-like flowers. This flowered very freely in the month of June.

Black Walnut *(Juglans nigra)*.—This variety fruited very well. The Japanese varieties did not fruit very freely this year, but they make splendid shade trees.

HEDGES.

The hedges are of interest here and take up quite a portion of the garden. Several of the poorer ones were taken out this last spring and what are left still make a good collection. During the summer months they were dug along either side, which has improved them a great deal. The following are the varieties still here.

Ligustrum sp.—Height 6 feet. This is a very good plant for a hedge, the best variety being *Ligustrum ovalifolium.* This has a larger leaf than the common or evergreen variety but the latter being a cheaper variety, can be well recommended.

Salix, red-twigged var.—This has made a very compact hedge, but is not so ornamental as some of the other hedges. Height 5 feet.

Beech, common European.—This is a fine hedge, being both ornamental and useful. The beech retains its leaves until spring, so gives some colour during the winter months. Height 4 feet.

Thorn, common European.—This is a very useful hedge, is a quick grower and can be trimmed easily; but in this damp climate, it is inclined to be mossy. Height 6 feet.

Deutzia gracilis.—The late frost in April killed the bloom in its young state, so very little flower was to be seen this year, but during the summer the hedge made a good lot of young growth. Where the soil is poor and sandy, it has not made such strong growth. In some places it is subject to moss. Height 4 feet.

Hemlock spruce.—This is a fine wide hedge and is to be well recommended for ornamental work. Height 4 feet.

Picea pungens (Rocky Mountain spruce).—This makes a nice evergreen hedge about 3 feet 6 inches.

Taxus baccata erecta.—This is a slow-growing variety, but this season it has made better growth. Height 2½ feet.

Holly, common.—This is the finest hedge of any and very much admired. As well as being a useful hedge, it is very ornamental and at all times it is very tidy. Height 5 feet 9 inches.

Retinospora squarrosa.—A neat compact hedge, but only suitable for ornamental purposes. Height 3 feet 6 inches.

Acer campestre.—This is a strong grower and requires cutting back. It is very pretty in the summer time when it shows its red tips. Height 6 feet.

Box (Common variety).—This has made very slow growth. Height 1 foot.

Salix (Rosemary-leaved).—Although a pretty plant, it does not make a good hedge. Height 2 feet.

Buckthorn.—If kept in control, this should make a useful hedge, but it is inclined to be dirty as the weeds are hard to get out at the base. Height 3 feet.

Yew (*Taxus baccata*).—This is a very ornamental hedge and compact in habit and is evergreen. Height 2½ feet.

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Spiraea crenata.—In its young state, this hedge would look very well, but as it gets older it is very untidy in appearance at the base. Height 4 feet.

Spruce, Norway.—This is a very compact hedge but the sides have got very bare. Height 4 feet.

CLIMBERS.

There are not many varieties but the following are doing well here:—

Wistaria chinensis.—This flowers very freely in May and June and again in the autumn.

Aristolochia Sipho (Dutchman's Pipe).—This is a very stately climber with its large leaves and is a very rapid grower. It flowers freely but the flowers are very small. Several seed vessels were found on the plants this autumn.

Ampelopsis hederacea (Virginia creeper).—This is a very strong grower, but not one of the self-clinging varieties. In the autumn the foliage turns a beautiful scarlet before falling. This also seeded freely.

HERBACEOUS PLANTS.

The plants in the herbaceous border this year are as follows:—

Agrostemma (Rose Campion).
Anchusa italica (Dropmore variety).
Anemone japonica alba (Japanese windflower).
Anemone japonica (Co p d'Argent).
Anemone japonica (Whirlwind).
Aquilegia (Columbine).
Arabis alpina fl. pl.
Boltonia asteroides.
Campanula carpatica.
Campanula persicifolia alba.
Campanula latifolia alba.
Campanula persicifolia alba.
Campanula medium (Canterbury bells).
Chrysanthemum maximum..
Clematis recta.
Convallaria (Lily of the Valley).
Coreopsis grandiflora.
Cimicifuga racemosa.
Delphiniums, species.
Digitalis (Foxglove).
Galega officinalis alba.
Gypsophila paniculata.
Helenium autumnale (Riverton Gem).
Helianthus rigidus (Ha palium).
Helianthus multiflorus (Soleil d'Or).
Helianthus maximus.
Hemerocallis flava (Day Lily).
Hemerocallis (Soleil d'Or)
Iberis sempervirens.
I is germanica (F ag, iris).
Iris Kaempferi (*laevigata*), (Japanese iris).
Iris sibirica (Siberian iris).
Lupinus polyphyllus and *albus.*

Phlox, named varieties.

Henry Murger.
Bridesmaid.
Vesuvius.
Mad. Paul Dutrie.
Geo. A. Strohlein.
Bacchante.
Helen Vacaresco.
Siebold (scarlet).
Antonin Mercie.
Coquelicot.
Mrs. Jenkins.
Edmund Rostand.
Von Hochberg.
Jeanne d'Arc.
R. B. Struthers.
Selma.
Von Lassburg.

Alpine varieties.

Phlox ovata, an evergreen foliage variety with deep rose flowers.

Phlox S. F. Wilson, a dwarf mauve variety.

Paeonies.—There are several unnamed French varieties that flowered very freely in the month of June.

Papaver orientale.
" *orientale* var Salmon Queen.
" *nudicaule* (Iceland poppy).
Polemonium, Richardsonii album.
Rudbeckia laciniata fl. pl. (Golden Glow).
Rudbeckia Newmannii.
" *nitida autumnalis.*
Scabiosa caucasica.
Spiraea Aruncus.
Spiraea chinensis rosea.
" *japonica.*
" *Venusta.*
Thalictrum adiantifolium.
" *glaucum.*
" *flavum.*
" *dipterocarpum.*
Trollius (Globe flower). Golden globe).
Yucca filamentosa.

AGASSIZ.

EXPERIMENTAL STATION, INVERMERE, B.C.

REPORT OF THE SUPERINTENDENT, G. E. PARHAM.

The Invermere Experimental Station is situated in the midst of country of which the land on the farm is distinctly typical. The soil is light, deficient in humus and has a moraine subsoil. This is essentially an irrigation country.

THE SEASON.

The season of 1914 was, on the whole, unfavourable for horticultural work. The spring was backward, and July was the only month in the year without frost. Work on the land began the first week in April, but seeding did not commence till April 23, and cold nights and high winds retarded the growth of all herbaceous plants, and rendered them late in blooming. Our location in the Columbia Valley, with the Rocky Mountains on the east, and the Selkirk range on the west, considerably shortens our hours of sunlight; and reports from surrounding districts seem to indicate that we are from ten days to a fortnight behind other places in the same latitude which are not so confined by the mountain ranges. Rain fell at fairly short intervals and it was necessary to irrigate most of the vegetable plots only once.

VEGETABLES.

Asparagus.—The asparagus planted in the autumn of 1913 stood the winter well, and made good growth. From the fact that it was planted in rows three feet apart, it was possible to cultivate it entirely with a single horse cultivator. An application of farm manure was made in the autumn.

Beans.—Nine varieties were tested. They were sown May 13, and irrigated once on June 8:—

Name.	Ready for use.	Total Yield.
1. Extra Early Refugee	July 30	4 pounds 13 ounces
2. Extra Early Valentine	" 30	8 " 14 "
3. Wardwell Kidney Wax	" 23	9 " 3 "
4. Valentine Wax	" 30	10 " 1 "
5. Golden Wax	" 30	12 " 12 "
6. Refugee, or 1,000 to 1	" 30	1 " 4 "
7. Grennell Rustless Wax	" 30	11 " 10 "
8. Bountiful Green Bush	" 30	13 " 14 "
9. New White Seeded Stringless Green Pod	" 30	7 " 1 "

Brussels Sprouts.—Dwarf Improved made good growth, and produced sprouts of excellent quality.

Cabbages.—Fifteen varieties were tested. The seed was sown in the open on April 23. All germinated well, but the young plants were badly attacked by the Lesser White Cabbage Moth and appeared to be almost destroyed. The plants were dressed with pyre-

thrum powder mixed with some of our powdery soil in place of flour as generally used. They recovered marvellously as soon as better weather conditions prevailed and produced good yields. Irrigated once on June 8.

Name.	Sown.	Ready for for use.	Average weight.	Quality.
			Lb.	
1. German Nofalt	April 23	Aug. 8	6	Good.
2. Erfurt Small	" 23	July 27	3	Good.
3. Lubeck	" 23	Aug. 12	7	Good.
4. Magdeburg	" 23	" 20	6	Good.
5. Winningstadt	" 23	" 12	7	Fair.
6. Early Jersey Wakefield	" 23	" 1	7	V. Good.
7. Large Flat Drumhead, Late	" 23	" 20	5	Fair.
8. Ex. Early Midsummer Savoy	" 23	" 12	5	Good.
9. Fottler Improved Brunswick	" 23	" 20	9	"
10. Paris Market, Very Early	" 23	July 22	3	V. Good.
11. Copenhagen Market	" 23	Aug. 12	9	Good.
12. Danish Summer Ballhead	" 23	" 12	5	"
13. Flat Swedish	" 23	Sept. 1	4	Fair.
14. Ex. Amager Danish Roundhead	" 23			
15. Impd. Amager Danish Roundhead	" 23	Sept. 1	5	Good.

Cauliflower.—The three varieties, viz.: Early Snowball, Extra Selected Early Erfurt Dwarf and Danish Giant produced some good heads and were about equal in merit.

Carrots.—Of the two varieties tested, Half Long Chantenay and Improved Nantes, the former gave the better results, although both did well.

Celery.—Seven varieties were tested. They were sown in hotbed on May 17, but owing to the unfavourable condition of the hotbed, the germination and early growth was slow. They were placed in the cold frame on June 4, and planted out in trenches on July 7. Though the results on the whole were not good, the following varieties made the most satisfactory growth, and were ready for use by November 1: Giant Pascal, Evans Triumph and French Success.

Cucumbers.—Planted in the open were a complete failure, being killed by early frost.

Corn.—Fourteen varieties were planted on May 29, on well manured land. Early Malcolm was the only variety of which cobs developed sufficiently for table use, though all made luxuriant growth.

Name.	Sown.	Height.	Weight of Fodder.	Cobs.
		Ft. in.	Lb.	
1. Pocohontas	May 29	5 0	186	Few.
2. Early Iowa	" 29	4 0	119	"
3. Metropolitan	" 29	5 0	179	"
4. Early Evergreen	" 29	4 6	174	None.
5. Country Gentleman	" 29	5 0	141	"
6. Early Fordhook	" 29	4 0	130	"
7. Golden Bantam	" 29	2 10	116	"
8. Stowell Evergreen	" 29	3 0	113	"
9. Extra Early Adams	" 29	2 0	73	Few.
10. Black Mexican	" 29	2 6	97	None.
11. Perkins Extra Early Market	" 29	3 0	128	"
12. Early Dawn	" 29	2 0	78	Few fit for table.
13. Early Malcolm	" 29	2 6	246	Many, some fit for table
14. Malakoff	" 29	5 0	196	Few.

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Lettuce.—Eleven varieties were tested in the open. Owing to the unfavourable conditions in the early spring none produced good heads.

Musk Melon and Water Melon.—These were all frosted and a failure. Water melon and Musk melon which remained in the hotbed did well and produced fruit. One Musk melon weighing $4\frac{1}{4}$ pounds, was cut September 30, and a Water melon weighing 20 pounds was harvested on September 14.

Onions.—Seven varieties were tested. The seed was sown in the open on April 27. but the cold weather checked the growth and no good results were obtained, except from young onions transplanted in June.

Parsley.—Double Curled made vigorous growth. Boxes placed in the cellar kept a good supply of green parsley for use throughout the winter.

Parsnip.—Good roots were produced by both varieties, viz.: Improved Hollow Crown and Intermediate.

Pepper.—Four varieties were tested. The growing season, however, was too short for any to come to maturity.

Peas.—Fifteen varieties were sown on April 23, in rows 30 feet long. The Lincoln and Telephone were considered the best quality.

Name.	Sown.	Picking.		Height.		Total Crop.	
		First.	Last.	ft.	in.	lb.	oz.
1. Dainty Duchess	April 23	July 23	Aug. 10	3	6	22	0
2. Gradus	" 23	" 16	" 10	2	6	17	0
3. Sutton Excelsior	" 23	" 23	" 10	2	6	15	4
4. McLean Advancer	" 23	" 23	" 10	2	0	21	0
5. Gregory Surprise	" 23	" 14	" 10	3	0	15	8
6. American Wonder	" 23	" 14	July 23	1	6	11	0
7. Premium Gem	" 23	" 14	" 14	1	0	7	0
8. Heroine	" 23	Aug. 4	Aug. 10	3	6	29	0
9. The Lincoln	" 23	July 27	" 10	2	6	23	0
10. Juno	" 23	" 4	" 10	3	0	20	0
11. Stratagem	" 23	" 4	" 10	3	0	14	0
12. Telephone	" 23	July 23	" 10	2	6	20	0
13. Thos. Laxton	" 23	" 14	" 10	3	0	13	0
14. Quite Content	" 23	" 27	" 10	4	0	19	0
15. Early Giant	" 23	" 16	" 10	4	0	13	8

Five varieties of peas for canning were also tested which gave the following returns per row of 50 feet:—

		Lb.
Richard Sedden	Total Crop.	30
Saxonia	" ..	35
Pride of Market	" ..	$29\frac{1}{2}$
Yorkshire Hero	" ..	$37\frac{1}{2}$
Excelsior	" ..	34

Samples of each were canned and the following were considered the best flavoured viz.: Excelsior and Pride of the Market.

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A late planting test of the following varieties was also made:—

Name.	Date of Sowing.	Ready for Use.
1. Stratagem	June 30	Did not mature.
2. Thos. Laxton	" 30	Aug. 25
3. Excelsior	" 30	" 20
4. Gradus	" 30	Sept. 7
5. Heroine	" 30	" 26
6. Gregory Surprise	" 30	Aug. 15
7. American Wonder	" 30	Sept. 1

Tomatoes.—Nine varieties were tested. Seed sown in hotbed April 8, and plants pricked out May 15. Cold winds in June stunted their growth and few plants produced mature fruit. The plants were cut by frost in August.

Potatoes.—Were planted in rows of 66 feet, sets 1 foot apart, and rows 30 inches apart and gave the following results:—

Name.	Character.	Flavour	Texture	Ckg.	Mark. Yd.	Un-mark.	Matured.
					Lb.	Lb.	
1. Empire State	Reg. Med. Eyes	V.G.	V.F.	S.	46	17	Aug. 25
2. Eureka Extra Early	Irr. Deep "	P.	Fl.	"	49	22	" 25
3. The Factor	Reg. Shlw. "	M.	"	"	28	18	Sept. 1
4. Gold Coin	Irr. " "	G.	V.F.	"	43	11	" 1
5. Early Ohio	" Deep "	P.	Waxy	"	68½	13	Aug. 10
6. Early White Albino	" Med. "	M.	V.F.	"	56	16	" 25
7. Early Rose	" Deep "	P.	Fl.	M.	55	18	" 15
8. Early Six Weeks	" Med. "	P.	"	S.	75	16	" 10
9. Early May	Reg. Deep "	F.	"	F.	48½	21	" 10
10. Early Norther	Irr. " "	P.	"	"	68¼	15	" 25
11. Early Hebron	" " "	V.G.	V.F.	S.	68	19	" 25
12. Dobbie Prolific	Reg. " "	V.G.	Fl.	M.	37½	20½	Sept. 1
13. Delaware	" " "	P.	Waxy	S.	57½	12½	" 1
14. Up-to-date	" Shlw. "	G.	Fl.	"	35	14	" 1
15. Pan-American	Irr. Deep "	P.	"	"	61	18	Aug. 25
16. Wee McGregor	Reg. Shlw. "	V.G.	"	F.	91	19	" 25
17. Sir Walter Raleigh	" Med. "	V.G.	"	S.	87	20	" 15
18. Snow	" Shlw. "	M.	V.F.	"	89	12	" 25
19. The Scott	" " "	V.G.	Fl.	F.	42	31	Sept. 1
20. Table Talk	" " "	P.	"	M.	47	13	" 1
21. Todd Wonder	Reg. Med. "	G.	"	"	40	10	" 1
22. American Wonder	" Shlw. "	V.G.	Fl.	F.	49	11½	Aug. 10
23. Bovee	Irr. Deep "	G.	Waxy	S.	65½	24	" 10
24. Burpee Extra Early	" Med. "	F.	Fl.	"	85	9	" 10
25. Carman No. 1	" Shlw. "	G.	"	"	56	19	Aug. 25
26. Conquering Hero	Reg. Shlw. "	V.G.	V.F.	F.	21	27	" 25
27. Clyde	" " "	G.	Waxy	S.	49	7	Sept. 1
28. Dalmeny Hero	" Med. "	P.	"	"	19	28½	" 1
29. Silver King	Reg. Shlw. "	V.G.	Fl.	"	47	18	Aug. 25
30. Manistee	Irreg. Med. "	G.	"	F.	51	27	" 25
31. Late Puritan	Reg. " "	V.G.	V.F.	"	82	14½	" 25
32. Irish Cobbler	Irr. Deep "	P.	Waxy	S.	92	19½	" 5
33. Houlton Rose	" " "	P.	Fl.	F.	89	13	" 25
34. Green Mountain, 1838	Reg. Med. "	M.	V.F.	M.	66	10½	" 25
35. Green Mountain, 1837	" " "	G.	Fl.	S.	67	12	Sept. 1
36. Bermuda Early	Irr. Deep "	P.	Waxy	"	24	8½	Aug. 10
37. Scottish Triumph	Reg. Shlw. "	G.	Fl.	F.	31	30	Sept. 1

The above tabulation necessitated a number of abbreviations. Character describes shape of potato, whether deep or shallow eyes. Flavour: Good, medium or poor. Texture: Waxy or floury. Cooking: Fast, medium or slow.

INVERMERE.

SQUASH.

Name.	Sown	Ready for use.	Average weight Hill.
			Lb.
1. Long Vegetable Marrow	May 8	July 25	68
2. Long White Bush	" 8	" 25	31
3. Mammoth White	" 8	" 25	36
4. Hubbard	" 8	" 25	28
5. White Congo	" 8	" 25	00
6. Custard Marrow White Bush Scallop	" 8	" 25	13
7. Golden Hubbard	" 8	" 25	18
8. Crookneck	" 8	" 25	16
9. Delicious	" 8	" 25	3
10. Delicata	" 8	" 25	17

Egg Plant.—These were frosted before they had time to mature.

Rhubarb.—Three new varieties, Prima Donna, Raspberry and Monarque were added to the five varieties planted in 1913, which latter have made luxuriant growth and promise well.

Sea Kale.—A test was made of the value of sea kale as a winter vegetable. Year-old crowns, placed in the cellar for the winter, were moved nearer the furnace on February 16, the crowns being covered with boxes and sacking. By March 4 the average height was 12 inches, and three crowns cut weighed 14 ounces. On March 12 the last heads were cut (thirteen in all), the total weight being 4 pounds 2 ounces. The table qualities were excellent. We also have for further experimentation a number of "whips" which were placed in boxes of earth for the winter. These showed signs of growth on February 24, and will be planted out as soon as weather conditions are favourable.

Citron and Pumpkin.—Both grown in the open, did well and produced good yields.

Cultural Operations and Irrigation.—As in the previous year, all garden truck was so arranged that it could be cultivated with the Planet Junior horse cultivator. Although. as yet, the destruction of annual weeds has not been a serious problem, constant cultivation is necessary in order to keep a good dust mulch as a means of retaining soil moisture.

Rain fell at opportune times, thus necessitating only one irrigation for most of the vegetable plots.

FLOWERS.

Bulbs.—Tulips, Daffodils and Scillas planted in the autumn of 1913 made a splendid showing during the months of April and May, and were much admired. The tulips were especially fine, and, out of the twenty-four varieties planted, the following were considered the best: Pottebakker, White and Scarlet, Keizerskroon, Proserpine and the Darwins.

Crocuses produced blossoms which never showed above the foliage.

Sweet Peas.—Sixty-three varieties were seeded in the hotbed and planted out on May 4. They were in bloom on July 1. They blossomed well and continued to make a good show until the third week in October. Noticeably excellent varieties were: Elsie Herbert, Helen Pierce, St. George, Doris Usher, Prima Donna, Nubian, Asta Ohn, Barbara.

INVERMERE.

BUSH FRUITS.

All bush fruits, planted in the spring of 1913, have made good growth and promise to yield good crops next season. The fruit from two bushes of Oregon Champion gooseberries produced 4 pounds 3 ounces and 3 pounds 11 ounces respectively.

APPLES.

The experiment with apples is as yet not sufficiently advanced to allow any conclusions as to the suitability of the locality for apple culture, or as to which varieties will do best. The trees which made a good start in 1913 have continued to make satisfactory growth.

The Cultural Tests set out in 1913, of which particulars are given in the annual report of that year, have been continued.

ORNAMENTAL SHRUBS AND TREES.

A consignment of ornamental trees was received from Ottawa on May 14 and planted in a nursery, to be transplanted when the ornamental grounds of the Station are laid out. An avenue of Norway maples has been planted along the southern boundary of the experimental grounds on a road leading to the hospital, and also along the north drive. The trees in both cases are planted 30 feet apart and have made a good start. They are protected by simple but efficient guards made with three posts and wire.

INVERMERE.

EXPERIMENTAL STATION, SIDNEY, B.C.

SAMUEL SPENCER, FOREMAN-MANAGER.

The spring work commenced early in April at the Sidney Station with fine weather and light showers. During this season many fruit trees, including all the important kinds at all likely to succeed, were planted out, as well as ornamental trees, shrubs and herbaceous plants. By May, sweet peas were 3 feet high and in full bloom. During June the cold nights with dry weather checked growth generally; both in this month and July vegetables suffered from lack of moisture. The records of the season's growth of the fruit trees show a strong growth. Some of the orange trees which are being tested made a growth of 10 inches. The remarkable climate of this district is shown by the fact that the extreme variation between maximum and minimum temperature in summer is 44 degrees and in winter only 25 degrees. The lowest temperature in the winter of 1914-15 was 27·5° Fahr. in January, 1915. Fall ploughing and systematic drainage are important to prevent souring of the soil during the winter when three-fifths of the yearly rain falls. For the Meteorological records of this station the reader is referred to the report of the Director. The remarkably mild climate of Sidney is shown by these records.

FRUITS AND OTHER ECONOMIC PLANTS.

One thousand and sixty-two trees of the following fruits, viz., Cherry, quince, medlar, almond, apricot, peach, plum, pear and apple, orange, filbert and walnut were planted during the spring and 94 per cent are in good condition. They were sprayed several times during the season for aphides. Two shipments of orange trees were received, one from the Department of Agriculture, Washington, all the trees of which died, the others came from Japan, and are doing well.

Black, red and white currants, raspberries, strawberries, Loganberries and blackberries only produced an average crop on account of the plots being under water during the winter months. Of the strawberries, "Magoon" variety produced the best crop. The currants were sprayed several times during the summer for aphides.

A small plantation of *Rhamnus Purshiana* (Cascara) consisting of plants collected in this district was planted during the spring and all have made good growth.

About one-quarter acre of holly trees were planted, most of which are living and making good growth.

All the lavender which was planted last spring is alive and in a good growing condition.

NUMBERS AND VARIETIES OF TREE FRUITS PLANTED, 1914.

Apples.—Twenty-seven varieties with a total of 153 trees as follows: 10 Cox Orange Pippin, 2 Charles Ross, 10 Duchess of Oldenburgh, 2 Delicious, 10 Gravenstein, 12 Grimes Golden, 12 Jonathan, 2 King David, 11 King of Tompkins Co., 7 Lowland Raspberry, 1 Linton, 1 Melba, 2 Mr. Gladstone, 7 McIntosh, 1 Percival, 1 Petrel, 14 Red Astrachan, 2 Rome Beauty, 3 Saint Germain, 2 Sweet Bough, 1 Trenton, 2 Transparante-de-croncels, 13 Wagener, 10 Wealthy, 2 Wismer Dessert, 2 Winter Banana, and 10 Yellow Transparent.

Crab apples.—Three varieties: 3, Florence, 2 Hyslop and 2 Transcendent.

Almonds.—Two varieties, Hard and Soft Shell.

Apricots:—Twelve varieties represented by 23 trees: 2 Blenheim, 1 De Boulbon, 2 Du Chancelier, 4 Hatif du Clos, 2 Gros Saint Jean, 1 Liabaud, 1 Moorpark, 2 Magyar Legjob, 2 Paviot, 2 Superb, 2 Sucré-de-Holub and 2 St. Ambroise.

Sweet Cherries.—Thirty-six varieties totalling, 83 trees: 1 Abbesse d'Oignies, 13 Bing, 2 Black Hawk, 2 Belle Magnifique, 2 Beauté de l'Ohio, 1 Belle d'Orleans, 2 Black Tartarian, 1 Belle de Choisy, 1 Choque, 1 de Mézel, 1 d'Annonay, 2 Elton, 1 Emperor François, 3 Empress Eugenie, 1 Früheste der Mark, 1 Gros Blanc, 1 Gros Noir, 2 Gros Rouge, 1 Jaune de Buttner, 2 Jaboulay, 1 Jeffrey Duke, 5 Lambert, 2 May Duke, 3 Marjolet, 2 Napoleon, 2 Pélissier, 1 Pleureur, 2 Pourpre Hâtive, 1 Précoce de Tarascon, 1 Précoce Rivers, 9 Royal Anne, 2 Reine Hortense, 2 Reine Hortense Hâtive, 2 Tardif de Ladé and 7 Windsor.

Sour Cherries.—Sixteen varieties represented by 75 trees: 1 Anglaise Tardive, 3 A Brindilles, 2 Anglaise Hâtive, 2 Belle de Franconville, 1 De Belleu, 11 Early Richmond, 15 English Morello, 2 Gros Gobet, 1 Griotte Acher, 1 Griotte du Nord, 3 Montmorency Brettoneau, 12 Montmorency, 2 Montmorency Pleureur, 2 Nouvelle Royale, 16 Olivet and 1 Pleureur.

Oranges and Hybrids Citrus Fruits.—Nine varieties are included in the 38 citrus trees planted, viz.: 5 Bigaradia, 5 Decumana, 5 Elliptical Fruit, 5 Media Acida, 3 Norton, 3 Round fruit, 1 Savage Seedling, 10 Unshiu, and 1 Willets Seedling.

Medlars.—Three varieties of Medlars represented by 10 trees: 4 De Hollande, 2 Ordinaire and 4 Sans Pépin.

Nectarines.—One tree of each of the following varieties of Nectarines: Boston, Lord Napier and Stanwick.

Standard Pears. Two hundred and fifty pear trees made up of 49 varieties: 40 Anjou, 2 André Desportes, 20 Bosc, 20 Bartlett, 20 Boussock, 2 Beurré d'Avril, 1 Besi de Chaumontel, 1 Beurré Bachelier, 2 Beurré d'Amanlis, 2 Beurré de Naghin, 2 Beurré Diel, 2 Belle Lucrative, 2 Beurré d'Hardenpont, 2 Beurré Giffard, 2 Beurré Hardy, 20 Clairgeau, 2 Charles Ernest, 20 Dr. Jules Guyot, 2 De Curé, 1 Docteur Jules Guyot, 2 Doyenné de Merode, 2 Doyenné d'Alencon, 2 Doyenné d'Hiver, 1 Doyenné du Comice, 1 Duchess d'Angouleme, 2 Emile de Heyst, 2 Easter Beurré, 2 Clapp Favourite, 2 Fondante Thirriot, 2 Flemish Beauty, 2 Jargonelle, 20 Kieffer, 20 Louise Bonne, 2 Le Lectier, 2 Lincoln Coreless, 1 Madame Ballet, 1 Madame Ernest Baltet, 1 Nouvelle Fulvie, 2 Passe-Crassane, 1 Président Deviolaine, 2 Pitmaston Duchess, 2 Princess, 1 Royal Vendee, 1 Souvenir du Congrès, 1 Triomphe de Vienne, 2 Virginie Baltet, 2 Bartlett (Williams), 2 Wilder Early and 2 Vicar of Winkfield.

Dwarf Pears.—Thirty varieties of Dwarf pears with a total of 53 trees: 2 André Desportes, 2 Besi-de-Chaumontel, 2 Beurré Bachelier, 1 Beurré d'Amanlis, 2 Beurré de Naghin, 2 Beurré d'Hardenpont, 1 Beurré Diel, 2 Beurré Giffard, 1 Beurré Hardy, 2 Charles Ernest, 2 De Curé, 2 Docteur Jules Guyot, 2 Doyenné de Merode, 2 Doyenné d'Alencon, 2 Doyenné d'Hiver, 2 Doyenné du Comice, 2 Clapp Favourite, 2 Fondante des Bois, 1 Fondante Thirriot, 1 Louise Bonne d'Avranches, 1 Madame Ballet, 2 Madame Ernest Baltet, 2 Nouvelle Fulvie, 2 Président Deviolaine, 2 Passe-Crassane, 2 Royale Vendee, 2 Souvenir du Congrès, 1 Triomphe de Vienne, 2 Virginie Baltet, 2 Bartlett (Williams).

Peaches.—Six varieties represented by 11 trees: 2 Alexander, 2 Early Crawford, 2 Fitzgerald, 2 Hale Early, 1 Triumph and 2 Yellow St. John.

Plums.—Thirty-two varieties represented by 116 trees: 2 Black Diamond, 2 Bradshaw, 1 Burbank, 2 Columbia, 2 Coe Golden Drop, 2 Drap d'Or, 2 De Létricourt (Prune), 2 De Zimmer (Prune), 3 D'Ebersweier (Prune), 2 English Damson, 2 Greengage, 2 Grand Duke, 17 Italian Prune, 2 Jaune Hâtive de Thoissey, 1 Le plus

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précoce de tous, 2 Maynard, 2 Mallard, 2 Pond Seedling, 4 Précoce de Bühlerthal (Prune), 15 Peach Plum, 1 Minot Prune, 4 German Prune, 15 Reine Claude de Bavay, 1 Silver Prune, 2 Sugar Prune, 2 Santa Rosa, 14 Shropshire Damson, 2 Tragedy Prune, 2 Victoria, 2 Washington, 2 Yellow Egg.

Quinces.—Eight varieties represented by 30 trees: 6 Champion Comina Orange, 4 De Portugal, 4 De Bereckzki, 4 De Bourgeault, 2 De Vranja, 4 Fabre, 3 Ordinare and 3 Pineapple.

OTHER TREE PLANTING.

Other features of the year was the planting of each side of the East Saanich road with *Liriodendron tulipifera* (tulip tree), the main avenue with *Platanus Orientalis* (plane tree) and *Cornus Nuttallii* (native dogwood).

An arboretum 135 feet wide was planted on the north, west and south boundaries, west of the East Saanich road, with many species and varieties both of native and exotic trees and shrubs.

VEGETABLES.

POTATOES.—From the 37 varieties received from Ottawa, 24 varieties from Indian Head and 18 varieties from Agassiz in the spring of 1913, the following tests were made on plots Unmanured and plots Manured with fresh stable Manure ploughed in with the potatoes grown at Sidney in 1913. Each test was made in 30-foot rows, 2½ feet apart and the tubers 1 foot apart. All the varieties were free from disease.

				Unmanured.					Manured.				
Variety.	Seed from in 1913.	Date Planted.	Date Harvested.	Un-marketable.	Marketable.	Total.	Total yield per acre.		Un-marketable.	Marketable.	Total.	Total yield per acre.	
				Lb.	Lb.	Lb.	Ton.	Lb.	Lb.	Lb.	Lb.	Ton.	Lb.
Dalmeny Hero	Ottawa	May 20	Oct. 6	3	32	35	9	900	2	28	30	8	200
	Ottawa	" 20	" 6	3	28	31	8	740	2	29	31	8	740
The Factor	Agassiz	" 20	" 8	2	18	20	5	800	1	19	20	5	800
	Indian Head	" 21	" 10	1	9	10	2	1,400	1	17	18	4	1,720
Conquering Hero	Ottawa	" 20	" 5	3	21	24	6	960	4	27	31	8	740
Empire State	Agassiz	" 20	" 6	2	21	23	6	420	2	20	22	5	1,880
	Indian Head	" 21	" 8	2	21	23	6	420	1	22	23	6	420
Dobbie Prolific	Ottawa	" 20	" 5	5	30	35	9	900	3	37	40	8	200
Dalmeny Beauty	Agassiz	" 20	" 5	2	31	33	8	1,820	3	21	24	6	960
	Indian Head	" 21	" 10	1	16	17	4	1,100	1	24	25	6	1,500
	Agassiz	" 20	" 5	4	28	32	8	1,280	4	32	36	9	1,440
Table Talk	Ottawa	" 20	" 7	3	30	33	8	820	3	27	30	8	200
	Indian Head	" 21	" 9	2	20	22	5	1,880	2	31	33	8	1,820
Houlton Rose	Ottawa	" 20	" 5	3	24	27	7	580	3	28	31	8	740
	Indian Head	" 21	" 8	2	21	23	6	420	2	25	27	7	580
Everett	Agassiz	" 20	" 6	3	25	28	7	1,120	3	18	21	5	1,340
	Indian Head	" 20	" 5	3	22	25	6	1,500	2	20	22	5	1,880
	Ottawa	" 20	" 5	2	28	30	8	200	3	31	34	6	360
Late Puritan	Indian Head	" 20	" 6	2	26	28	7	1,120	3	27	29	7	1,660
	Agassiz	" 21	" 7	3	13	16	4	640	2	22	24	6	960

VEGETABLES.

Beans.—Beans were planted on May 23 in rows 30 feet long and 30 inches apart and 2 inches in the rows. Plants were up on June 3 and commenced to bloom on July 6. Bountiful and Refugee or 1,000 to 1 gave the best results. Eight varieties were grown, but the yield was below average.

Beets.—Seven varieties of beets were sown on April 24 in rows 30 feet long and 30 inches apart, germinating on May 4; afterwards they were thinned to 2 and 4 inches apart, being ready for use on July 13, the heaviest cropper being Egyptian Dark Red, there being no difference in quality of the seven varieties.

Brussels Sprouts.—Seed was sown on May 21, plants were up on the 24th, and planted out on June 25 in rows 30 feet long and 30 by 24 inches apart. They were late in coming into condition on account of the undrained condition of the soil and the period of drought which followed their transplanting.

Cabbage.—Seed was sown May 21 and pricked out on June 15. Planting took place on June 25 in rows 30 feet long and 30 inches apart (Early, 18 inches and winter, 24 inches apart in the rows). The crop was very small owing to the same conditions as affected the Brussels sprouts.

An experiment was conducted in order to find out the effect of maggot on pricked out and unpricked out plants. The plants that had been pricked out were not attacked by the maggot, but many of the unpricked out plants were lost through this pest.

Carrots.—Two varieties of carrots were sown on April 20 in rows 30 feet long and 30 inches apart, germinating May 1. They were thinned to distances of 2 and 4 inches and harvested October 13. Chantenay was the best cropper of the two, there being no difference in those thinned at 2 and 4 inches. Early Half Long Scarlet Nantes gave a better crop when thinned to 4 inches.

Cauliflower.—A very poor crop was harvested through the same cause as affected cabbage and Brussels sprouts. They were planted in rows 30 feet long and 30 by 18 inches apart.

Corn.—Eleven varieties of sweet corn were sown on May 22, the following six varieties producing the best crops. All were planted in rows 30 feet long and in hills 3 feet by 3 feet apart.

Variety.	Ready for use.	Yield per 12 hills.	
		Lb.	Oz.
Early Malcolm	Aug. 31	20	3
Metropolitan	Sept. 13	19	14
Pocahontas	" 13	19	1
Early Fordhook	Aug. 31	17	12
Early Iowa	" 31	13	8
Malakoff	Sept. 13	19	8

An experiment was carried out to ascertain the cropping value of topped and untopped corn. The plants were topped after flowering by the flowering spike being pinched out when about 4 feet 6 inches in height; the result will be seen from the following table:—

Variety.	Yield 12 hills untopped.		Yield 12 hills topped.	
	Lb.	Oz.	Lb.	Oz.
Early Malcolm	20	3	22	10
Metropolitan	19	4	13	14
Pocahontas	19	1	15	9
Early Fordhook	17	12	20	12
Early Iowa	13	8	13	2
Malakoff	19	8	23	4

Cucumbers.—On May 22 five varieties of cucumbers were sown in the open, Prize Pickling being ready for use on August 15, the remainder coming in on the 22nd of the same month. The best results were obtained from Giant Pera and Peerless White Spine. They were planted in hills 6 feet by 6 feet apart.

Lettuce.—Ten varieties of lettuce were planted, all of which did well. Dark Green Capucine, a Cos variety, All Heart, Unrivalled Summer and Iceberg gave the best crops. As regards quality, the curled leaf varieties were the best.

Onions.—Seven varieties of onions were sown on April 20 in 30-foot rows, 15 inches apart and then thinned to 2 and 4 inches apart, but did not produce a very good crop, the best variety being Red Globe with Dark Red Beauty second.

Parsley.—Double Curled parsley was sown on April 20 in rows 30 feet long, and was ready for use by July 6; it grew well, attaining a height of 1 foot.

Parsnips.—Seed of Intermediate and Improved Hollow Crown parsnip was sown on April 20 in 30 foot rows, 30 inches apart and thinned to 2 and 4 inches. Those at 4 inches produced the best results, Hollow Crown gave a better return than Intermediate.

Peas.—Fifteen varieties of garden peas were sown on April 20 in 30-foot rows, 3 feet apart. Plants were up on April 30, and were ready for use on June 26. The crop was small, the best varieties being Gradus, Heroine, and Early Giant for weight, whilst Quite Content gave the best results for size and quality.

Radish.—Seed was sown on June 29 in 30-foot rows, 15 inches apart. Varieties tested were Early Scarlet White Tipped and Forcing Scarlet Turnip and both gave good results and were quite free from maggots.

Salsify.—Long White salsify was sown in 30-foot rows on April 20, the plants were up on May 1 and thinned to 2 and 4 inches apart, those at 2 inches giving the best result. The crop being an average one, was harvested November 21.

Squash.—Ten varieties were sown in the open on May 22, 9 feet apart each way. Plants were up on June 8 and commenced to flower on July 16, being ready for use on August 15. The general condition of the crop was good although below the average. Long Vegetable Marrow, Delicious, Delicata and White Bush Scallop, and Custard Marrow gave the best returns.

Tomatoes.—Seed of 18 varieties was sown in hotbeds on April 15, germinating on the 24th of the same month. They were pricked out on May 6 and transplanted to open ground on June 8, in rows 4 feet by 4 feet. They commenced to bloom on the 20th of June and were ready for use August 22, the final picking of the fruit being on October 3.

The experiment on the Bush and Single Stem system has been carried on from 1913 with the following results.

Ten plants of each variety were planted, five being allowed to grow on the Bush and five on the Single Stem system:—

BUSH SYSTEM.

Variety.	Ready for use.	Weight of Ripe Fruit.		Weight of Unripe Fruit.		Total.	
		Lb.	oz.	Lb.	oz.	Lb.	oz.
N. Adirondack G. No. 1	August 22	13	12	22	00	35	12
Extremely Early IXL	" 22	12	5	24	00	36	2
Earliana, Sunnybrook	" 29	8	12	21	00	29	15
Alacrity	" 22	11	5	18	00	29	5
Earliest Round XXX	" 22	8	5	22	00	30	5
Jack Rose	" 29	7	2	22	00	29	2

SINGLE STEM SYSTEM.

Variety.	Ready for use.	Weight of Ripe Fruit.		Weight of Unripe Fruit.		Total.	
N. Adirondack G. No. 1	August 22	10	6	7	00	17	6
Extremely Early IXL	" 29	8	12	6	00	14	12
Earliana, Sunnybrook	" 29	11	12	8	00	19	12
Alacrity	" 22	7	1	5	00	12	1
Earliest Round XXX	" 22	5	7	9	00	14	7
Jack Rose	" 22	5	15	8	00	13	15

Turnips.—The seed of three varieties was sown on May 27 in 30-foot rows, 15 inches apart. Plants were up June 2 and were thinned to 2 and 4 inches. Those at 4 inches gave the best results, Early White Flat Strap Leaved being the best variety and was ready for use on August 22.

BULBS.

About 5,000 bulbs were imported and planted on the Station consisting of daffodils, tulips, crocus, etc., from Holland and made a good display during the months of April and May.

Of special attraction were the gladoli from Ottawa which were in full bloom in August, showing the climate and soil is adaptable for bulb growing.

The following annuals were sown in the hotbed on the 14th of April, and set out in the open on the 15th of May, most of them being in bloom until the 1st of November.

Name of Variety.	Number of Varieties.	Date commenced to bloom.
Alonsoa Warscewiczii compacta	1	Aug. 8.
Asters	20	" 10.
Antirrhinum	17	July 27.
Amaranthus tricolor splendens	1	
Alyssum	1	June 10.
Ammobium alatum grandiflorum	1	July 20.
Acroclinium roseum	1	" 14.
Balsam	1	June 30.
Bartonia aurea	1	" 25.
Coreopsis	5	" 30.
Chrysanthemum	1	
Centranthus macrosiphon	1	July 20.
Candytuft	1	" 6.
Clarkia elegans	1	" 13.
Carnation, marguerite	1	Aug. 24.
Coxcomb mixed	1	June 24.
Cosmos bipinnata	1	July 6.
Dianthus Heddewigii	1	" 14.
Dimorphotheca aurantiaca	1	" 6.
Daisy	1	Aug. 24.
Eschscholtzia	1	June 29.
Godetia	12	July 20.
Gypsophila elegans	1	Aug. 4.
Helichrysum, scarlet	1	" 10.
Jacobæa	1	Oct. 20.
Kochia trichophylla	1	Sept 19.
Leptosiphon hybridus	1	July 20.
Linum rubrum	1	" 6.
Marigold	2	" 6.
Nemesia	6	" 22.
Nicotiana affinis mixed	1	" 6.
Nasturtium	8	June 30.
Portulaca	1	" 30.
Phlox Drummondii	8	" 30.
Poppy, mixed	2	July 20.
Pansies	7	June 30.
Ricinus Bronze King	1	Aug. 31.
Rodanthe maculata alba	1	July 27.
Sweet Peas	84	" 6.
Swan River Daisy	1	" 6.
Salpiglossis	2	" 14.
Sweet Scabious	1	" 20.
Verbena	5	June 30.
Xeranthemum annuum superbissimum	1	Aug. 4.
Zinnia	5	July 6.

REPORTS OF EXPERIMENTS ON THE FRUIT FARM OF THOS. A. SHARPE, SALMON ARM, B.C.

The autumn of 1913 was dry and warm until its close, at Salmon Arm, and with the commencement of the winter the soil was quite dry for a depth beyond ordinary ploughing. The ground froze before it was covered with snow, an unusual occurrence in this district, and when the snow melted in the spring most of the water ran off owing to the frozen ground. The spring rains were unusually light and the summer very dry. The result of this drought was a light fruit crop, especially of blackcaps and blackberries, which more or less dried on the bushes.

The potatoes and other root crops were below average in yield, and rain in the latter part of the summer caused a second growth of the potatoes to take place, which while it added to the yields lowered the standard of quality.

On this farm the experimental orchard gave only a medium yield of fruit. The following varieties have either been removed, or when the variety is a vigorous grower the tree will be top-grafted to some other variety, as the fruit has been found after four seasons to be too small to be of commercial value: Jewetts Best, Ferris, Piedmont, Swayzie. A number of the young pear trees bloomed last year, but only two varieties fruited, namely, Dr. Jules Guyot and Flemish Beauty; both varieties are of fine appearance and very good quality. Three varieties of cherries fruited, Olivet, de Planchoury and Von der Nette, all of the sour family, and as our cherries come on the market when the crop from farther south is mostly off the market, prices and demand are good. There were no new varieties of plums fruited this year. Four varieties of grapes fruited, Saunders seedling, Goethe, Delaware and Brighton. All ripened fully before frost.

In garden or table corn the Malakoff, Cory and Golden Bantam are the most satisfactory of those tested up to date.

Tomatoes do very well, and the selected strain of Earliana seed sent out by the Central Experimental Farm has given very satisfactory returns, the plants being vigorous and productive, the fruit early in ripening, of superior quality and uniformly smooth.

SUBSTATIONS.

FORT VERMILION, PEACE RIVER DISTRICT, ALBERTA.

This substation is situated in the valley of the Peace river in latitude 58° 36′. It is over three hundred miles north of Edmonton, and is in charge of Mr. Robert Jones, who has prepared the following report:—

The horticultural work in 1914 has, it is believed, been of considerable value in giving information needed in this district, and while the season was unfavourable part of the time, on the whole it was a favourable one and some good results were obtained.

April opened rough and continued so until the 20th, when it got milder and what was thought at first would be a very late spring turned out to be an average one for earliness, and it was possible to get the hotbeds under way by the 22nd. The ground dried off very quickly, and a start was made at seeding grain on April 30. May opened fine, and work progressed nicely. The month of May was very dry, with considerable winds. The rainfall was very light in May, it raining on only three occasions, namely on the 17th, 0·6 inch fell; and on the 25th, 0·3 inch, and on the 26th 0·5 inch. On account of considerable moisture in the soil from the winter snow, some seeds that were sown early germinated very quickly. June also opened fine and was a splendid month for growth of all plants, although the precipitation was very light. One timely rain occurred on the 3rd and 5th of the month. The rain brought the crops along very rapidly. July opened very hot, with considerably more rain than usual, which was very much needed at this time. Haying commenced on the 15th. Wild hay was quite plentiful, and by this time some of the grain was commencing to change colour. The precipitation for July was 1¾ inches. The small fruits at the station were ripe on the 22nd, when picking commenced; the berries were small but very plentiful. Raspberries were not ripe until the end of the month. By this time all the flowers were in bloom. August opened showery and continued so throughout the month. August was quite warm throughout the month and on only two occasions did the temperature fall to the freezing point. On the 23rd the thermometer registered 31·2° F., and on the following morning 31·4°. The balance of the month was quite warm. Haying was not finished until the 22nd. September was a pleasant month, and advantage was taken of the fine weather to hurry work along. The first killing frost of the season occurred on the night of the 7th, when we had 7½ degrees of frost. The balance of the month was much milder. On September 10, the digging of potatoes was begun. Ploughing started on the 15th, with ground quite dry. By the end of the month fall work was pretty well along. Some extra work was done at the Station in moving the fence on the east and south side to make more room for both the horticultural and agricultural work, as with the large number of seedlings coming on, and with these to transplant, the 5-acre plot was found too small, and by moving the fence, 3 more acres have been taken in. October opened very fine, and has remained so up to the 14th, when this report closes. The days have been quite bright with cool nights. A large percentage of the fall ploughing has been done to date. The results of this season's work have been most successful.

APPLES AND PLUMS.

The apple trees have recovered somewhat from the severe killing back from the winter of 1913-14 which some of them experienced, and have made good growth during the past summer. The apple seedlings planted during the spring of 1914 have done very well and made good growth during the summer and are in good condition for winter.

STRAWBERRIES.

The strawberries raised from seed of cultivated varieties are doing well and if they come through the winter there will be quite a number for next spring.

CURRANTS AND RASPBERRIES.

The currants did very well. Two hundred and sixty-nine pints were picked. The raspberries were also a good crop and were quite large. The plot of Herbert yielded 50 pints and the plot of Heebner 59 pints. The season lasted from August 13 to August 24.

YIELDS OF CURRANTS.

Number of Bushes.	Varieties Tested.	Yield.
		Pints.
Black:		
2	Bang Up	11
2	Norton	11
2	Kerry	11
2	Climax	11
2	Topsy	11
2	Eclipse	11
2	Magnus	11
2	Saunders	11
2	Ethel	11
2	Ontario	11
2	Eagle	11
Red:		
2	Simcoe	12
2	Rankins Red	12
2	Greenfield	12
2	Moore Seedling	12
2	Goliath	12
2	Red Dutch	12
2	Large Red	12
2	Long Bunched Holland	12
2	Cumberland	12
White:		
2	Large White	7½
2	White Grape	7½
2	White Cherry	7½
2	White Kaiser	7½
2	White Dutch	7½
	Total	267

Picked from July 22nd until July 31st.

POTATOES.

The potato crop was very good in this district this year as the farmers endeavoured to get their potatoes planted as quickly as possible in the spring. Five varieties were tested at the Station this season. All the potatoes were planted on land that was in wheat in the season of 1913 and treated with an ample supply of manure at the rate of twenty wagon loads per acre, ploughed very deeply, well harrowed in the spring and furrows made three feet apart. Each plot was one-sixtieth of an acre.

FORT VERMILION.

There was no injury from rot in any of the plots and the tubers were almost uniformly large. Below are the results obtained. A larger field plot of Early Rose gave a yield of 320 bushels of medium sized potatoes. No potato bugs are as yet in the North Land.

POTATOES—Test of Varieties.

Name of variety.	Character of growth.	Average size.	Total yield per acre.		When planted.	When dug.	Form and colour.
			Bush.	Lb.			
Rochester Rose....	Fair..........	Medium	319	28	April 30....	Sept. 10 ...	Long, pink.
Carman No. 1....	Rank.........	Large	367	12	" 29....	" 10....	Flat, white.
Gold Coin.......	Very rank....	Very large....	441	20	" 30....	" 11....	Round, white.
Irish Cobbler......	Fair........	Medium	210	24	" 30....	" 11....	Round, white.
Early Rose........	Medium......	Medium	271	37	" 30....	" 10....	Round, pink.

GARDEN CORN.

Four varieties of garden corn were tested at the Station this year. These four varieties were planted in plots of ⅒-acre on May 4, and all cut on September 10. It was planted in hills two and a half by three feet apart on land that was in summer fallow the previous year. All of these plots of corn were cultivated a number of times to encourage the growth and to prevent the evaporation of moisture from the soil during the very dry spell in May and June.

The following were the results obtained:—

Name of variety.	Height.	Leafiness.	When tasseled.	In silk.	When in use.	Condition when cut.	Weight per acre grown hills.	
	Inches.						Tons.	Lb.
White Squaw..........	48	Very leafy....	July 10..	July 16..	Aug. 12..	Sept. 4, ripe.	4	1360
Malakoff..............	50	Leafy.........	" 18..	Aug. 4..	Sept. 4	Early dough..	11	1400
Early Malcolm........	40	Fairly leafy...	" 20..	" 6..	" 5..	Early milk...	7	400
Semi Sweet (seed from Colorado.	36	Fairly leafy...	" 8..	July 14..	Aug. 8..	Sept. 4, ripe..	4	640

ONIONS—Test of Varieties.

Four varieties of onions sown in open ground on May 6. Onions of medium size. The yield was estimated from 12 rows each 33 feet in length. The rows were 18 inches apart. The onions were taken up September 8.

Variety.	In use.	Yield per acre.	
		Bush.	lb.
White Barletta....................................	July 16	129	20
Early Flat Red Wethersfield........................	" 15	227	20
Large Red Wethersfield............................	" 18	260	40
Danvers Yellow Globe..............................	" 20	248	00

FORT VERMILION.

Garden Carrots.

Garden carrots sown in open ground on May 7, harvested on September 9, 12 rows of each 33 feet in length.

Variety.	In use.	Yield per acre.	
		Bush.	lb.
Extra Early Horn	July 15	430	12
Chantenay	" 13	480	00

Garden Peas—Sown May 8.

The garden peas did not grow quite as rank as usual. The vines averaged from 18 inches to 24 inches and the pods from 2 inches to 3 inches in length. The average number of peas in a pod was from 5 to 7. All peas ripened off very quickly on account of insufficient moisture. Peas of good quality.

Variety.	In use.	Ripe.
1. Stratagem	July 13	July 24
2. Witham Wonder	" 20	" 30
3. Admiral Dewey	" 20	Aug. 7
4. Henderson First	" 6	July 21
5. Gradus	" 15	" 31
6. Gregory Surprise	" 8	" 22
7. American Wonder	" 16	Aug. 4
8. Dwarf Telephone	" 16	" 6
9. Premium Gem	" 10	July 22

English Wonder Peas.

Sown on May 7, one row 33 feet in length fit for use July 11, ripe and picked on August 4. Seed of this variety was sent from Ottawa, spring of 1914. The yield from this one row will be kept for seed for next spring as this pea seems to be a very fine pea and quite productive and early.

Experiments with other Garden Vegetables.

Asparagus.—Asparagus from an old bed of Columbia White in use from May 22 until August. Quite large and of fine quality.

Rhubarb.—Rhubarb from the older beds of Victoria in use from May 20 until the first part of September, and then what was left was taken and made into jam for winter use.

Celery.—Paris Golden Yellow, White Plume and Golden Self Blanching were sown under glass on April 22. These were sown later than usual on account of considerable water settling in the hotbeds from the previous autumn rains. The three varieties were transplanted out on June 4 in pits 16 inches deep with about 5 inches of manure

at the bottom of same, and 3 inches of earth on top of the manure. Celery was only a moderate success. White Plume was the best.

White Plume, in use August 15, medium in size.

Paris Golden Yellow, in use August 20, small.

Golden Self Blanching, in use August 25, very small.

Beans.—Challenge Black Wax planted on May 6, in use (green) July 21, ripe on September 3. Very fine as a table bean.

Early Red Valentine planted on May 6, in use July 29. None of these ripened, as they were quite green when the frost occurred on the night of September 7.

Golden Wax, sown on May 11, in use July 15. Ripe and picked on September 3. This variety has matured with us for a number of seasons. Yield from 3 rows 33 feet in length, forty-eight hills, 15 pounds.

Dwarf Black Wax sown on May 11, in use July 20, ripe on September 5.

Table Beets.—Early Eclipse sown on May 6, fit for use on July 16, harvested on September 9, quite large and of fine quality. Sown in rows 20 inches apart and the plants thinned out to about 6 inches in the row. Yield from the twelve rows, 485 pounds.

Parsnips.—Hollow Crown sown on May 6, in use August 14, pulled on September 9, very small in size, yield from six rows 33 feet long, 80 pounds.

Table Turnip.—Early White Milan sown on May 7, resown on May 27, the first sowing having been destroyed by insects. In use July 23, very small, harvested on September 9, yield from four rows 33 feet long, 22 inches apart, and plants thinned out to 10 inches apart in the rows, 186 pounds. Roots small. All table turnips had the same treatment.

Golden Ball sown on May 7, resown on May 27. In use July 20, quite small, harvested on September 9.

White Stone sown on May 7, in use July 24, harvested on September 9, roots very small.

Radish.—Scarlet White Tipped sown May 6, in use June 3, very fine and of good quality. The second sowing on July 6 was all destroyed by worms.

Rosy Gem sown on May 6, in use June 4, very good.

French Breakfast sown on May 6, in use June 1, of good quality.

Lettuce.—Iceberg sown on May 6, in use May 29, very fine heads and quite large. The second sowing was done on July 6, in use August 12. Heads from the second sowing became very large. Three rows of each variety, 33 feet long.

Black Seeded Simpson sown on May 6, in use August 1, very fine.

Grand Rapids sown on May 6, in use June 4, resown on May 27, in use July 4, and sown again on July 6, in use August 10. This is a very fine lettuce being very crisp and tender.

New York sown on May 6, in use June 4, very good.

Parsley.—Exquisite Dwarf sown on May 6, in use June 3, very good quality. Taken up on September 9. 36 pounds from 3 rows 33 feet in length.

For the citrons, muskmelons, cucumbers, squashes and pumpkins I have used the same methods that I have followed for the past two seasons with the best of success. As this is the first season I have grown pumpkins I am more than pleased with the results obtained. All planted in hills 6 by 6 feet apart.

Citrons.—Four hills of these were planted on April 27, and four hills on May 4; one hundred fine citrons picked from the eight hills on September 8; average, 5 pounds.

Muskmelon.—Emerald Gem, four hills planted on May 4; thirteen muskmelons picked on September 8; average weight, $1\frac{1}{4}$ pounds, none ripe enough for seed.

Hackensack, four hills planted on May 4, picked on September 8; 9 melons, average weight 1 pound, not matured.

FORT VERMILION.

Cucumber.—High Grade White Spine, four hills planted on April 29; in use August 10; forty-four cucumbers picked on September 8, average 1 pound each.

Chicago Pickling four hills planted on April 29; in use July 30; fifty-five cucumbers picked on September 8, average weight 1 pound. Cucumbers this size were a wonder to a good many visitors to the Station.

Squash.—Long White Bush Marrow, six hills planted on May 6; in use August 3; fifty-six marrows picked on September 8; average weight 12 pounds, very fine flavour. These have been used for preserving.

Summer Crookneck, five hills planted on May 6; in use August 6; forty-eight squash picked on September 8; average weight, 3 pounds.

Pumpkins.—Large Connecticut Field, five hills planted on May 3 in hills 6 feet apart; 41 pumpkins picked September 8; average weight 20 pounds, fully matured and of excellent quality.

Sugar, five hills planted on May 6; in use August 20; fifty-two pumpkins picked on September 8 very fine and sweet and fully matured; average weight 9 pounds. This seems to be a smaller variety than the Connecticut Field.

Cauliflower.—Cauliflower and cabbage were somewhat smaller than usual. I was somewhat later in getting the seed sown in the hotbeds, and through the press of other work I was somewhat later in getting the plants out, as the transplanting came in the very driest part of the season. All taken up on October 6.

High Grade Dwarf Early Erfurt sown under glass on April 21; transplanted in the open ground on May 29 to June 2; in use August 7; average weight 5 pounds. Quality good, all taken up on October 6.

Paris, sown under glass April 22, transplanted out in the open ground on June 2; in use August 10; average weight 7 pounds; very fine and tender.

Cabbage.—Copenhagen Market sown under glass on April 21, transplanted to the open ground May 29; in use on August 11; average weight 11 pounds; heads very solid.

Early Paris Market, sown under glass on April 21; transplanted to the open ground on June 2; average weight 6½ pounds; heads quite firm and good.

Danish Ballhead sown under glass on April 21; transplanted to the open ground on May 28; average weight 13 pounds; heads quite solid and finely flavoured.

Early Jersey Wakefield, sown under glass on April 22; transplanted to the open ground on May 28; in use July 28; average weight 7 pounds; heads rather loose but very good in flavour.

Red Rock sown under glass on April 22; 50 plants transplanted to open ground on May 28; in use August 22; average weight 5½ pounds; heads very firm; a fine pickling variety.

Broccoli.—Sown under glass on April 22; twenty-two plants transplanted to the open ground on May 21; in use August 12; very fine.

Tomatoes.—Seeds of all varieties were sown under glass on April 23 and transplanted to the open ground on June 2. Tomatoes did remarkably well this season and were much more successful than other seasons, with a larger percentage of ripe fruit. Many visitors to the Station were astonished at our being able to pick ripe tomatoes from the vines on the Peace river, as this was thought impossible, and they have now come to the conclusion that seeing is believing.

Alacrity No. 2-24-9 sown under glass on April 23; forty plants were transplanted to the open ground on June 2; picked on September 6; yield from the forty plants was 150 pounds, 50 pounds of which fully matured.

Alacrity No. 2-24-10 sown under glass on April 23; forty plants were transplanted to the open ground on June 4; picked on September 16; yield from the forty plants was 148 pounds, 60 pounds being fully ripened, and the balance fairly ripe.

Sparks Earliana C. E. F. Strain sown under glass on April 24; twenty plants were transplanted to the open ground on June 3; picked on September 7; yield from the twenty plants, 96 pounds of fairly ripe tomatoes.

Atlantic Prize sown under glass on April 23; ten plants transplanted to the open ground on June 3; 31 pounds of green tomatoes picked on September 7.

Alacrity. I received from the Horticultural Division at Ottawa on May 6, 1914, one small packet of Alacrity tomato seed. The seeds were sown under glass on the evening of May 6, transplanted to the open ground on June 25. The plants were very small when set out. Tomatoes were very small when the frost occurred on September 7. As this is a very unequal test on account of the difference in time of the sowing of the different varieties, it will take another season to make any comparison, but I think with an equal start Alacrity 1914 will be as early and as productive.

SHRUBS.

The great number of varieties of flowering shrubs which succeed at Fort Vermilion is a surprise to visitors from farther south, who think that it is difficult to grow such things here.

In 1914 the Siberian pea tree, *Caragana arborescens,* was in bloom on May 27, *C. grandiflora* on May 29, and *C. pygmaea* on June 5. The lilacs began blooming on June 8, when the variety Charles X was in flower. This was followed by many other varieties of the common lilac; Himalayan or Chinese lilac, *Syringa villosa* was in bloom on June 16, and the lilac season was closed by the Japanese tree lilac *Syringa japonica* which was in bloom on June 26. The white flowered Japanese rose, *Rosa rugosa alba* was in bloom on June 22.

FLOWER GARDEN.

This year the flower garden succeeded remarkably well and the bloom was good until the last part of September and many of the plants were still in bloom October 14 when the report was sent in. The seeds of tender sorts were sown in the hotbeds on April 24 and the plants were set out in open ground from May 30 to June 15. The more hardy sorts were sown in the open on May 22.

This season produced the finest pansies I have had. The varieties worthy of special mention are Lord Beaconsfield, Giant Trimardeau and Giant White.

Some of the flowers especially worthy of note with dates of blooming are:—

Varieties.	When in bloom.	Remarks.
Aster, Semple Branching	August 20	Very fine bloom.
Balsam, Camellia Flowered	July 24	Very good.
Antirrhinum (Snap Dragon) Giant Flowering	" 18	
Antirrhinum, Tom Thumb White	" 20	
Phlox Drummondii	" 9	
Stocks	" 20	
Verbena (Hybrida)	" 29	
Zinnia	June 30	
Petunia	" 26	
Nicotiana (affinis)	July 14	
Sweet Peas (tall)	" 23	
Sweet Peas (Cupid mixed)	" 21	
Poppies, (Shirley poppy)	June 27	

The flower garden was greatly admired by the many visitors that saw it this summer, not only the flowers themselves, but also as regards the artistic way in which it was laid out.

FORT VERMILION.

GROUARD, LESSER SLAVE LAKE, ALTA.

The report which follows was prepared by Brother Laurent, O.M.I., the mission with which he is connected having charge of the work at Grouard.

The summer and autumn of 1913 having been very wet, it was not possible to put any work on the land for the following season. In consequence, on April 18, 1914, when the soil was sufficiently thawed out, we harrowed five times in order to get the land ready for sowing at the normal time. Conditions in May were favourable to the germination of the seed. June was also a good month for growth.

The following varieties of vegetables were sown in hotbeds during the first week of April:—

Cabbage and Cauliflower.—Early cabbage—Early Jersey Wakefield, Etampes, Early Spring, Paris; later cabbage—Improved Brunswick, Schweinfurt, Danish Copenhagen Market. Cauliflower—Maltais and Early Snowball. All the cabbage were transplanted to the garden the first week of June, and the early varieties were ready for the table July 15. The cauliflowers were ready for use on August 1. The later cabbage succeeded well, considering that the land where they were received no manure. The Danish and Copenhagen Market gave very fine hard heads, weighing on the average 20 pounds each.

Celery.—Sown during the first days of April, and transplanted to the garden the first week of June, the varieties tested being White Plume, Paris Golden Yellow, and Giant Pascal. The first two are to be preferred for this district, the last variety being too late. The first plants of celery were ready for the table the end of August.

Tomatoes.—Sown under glass on March 15, and transplanted in the frame in three weeks to a month, and finally planted in the garden on June 5. The plants yielded abundantly. Chalk Early Jewel did very well and yielded an abundance of fine, almost smooth fruit. The first fruits were ripe on August 10. The average weight of fruit from each plant was 14 pounds, there being 360 pounds harvested the first week of September.

Squash.—The variety Long White English Vegetable Marrow sown in pots under glass at the end of March and transplanted to the garden in hills on June 5, were good for the table on August 10. The average weight of a specimen was 10 pounds. Mammoth Squash and Pumpkins with the same culture were harvested the first week of September, the former weighing 56 pounds and the latter 32 pounds each.

Peas.—Alaska, sown April 30, was ready for the table on July 10, and is a very good early pea. Thos. Laxton, sown May 15, was ready for eating July 25, and Stratagem, sown in May, was ready for the table at the end of July, and is a good sweet pea with large pods.

Beans.—Two varieties of butter beans were tested, but the results were not satisfactory. They were, evidently, wrongly named.

Turnips.—The Early Milan turnip grew well enough, but the roots were badly affected with maggots. The Golden Ball was healthier.

Beets.—Eclipse, Fireball, Egyptian, and Dark Red Detroit yielded well. Sown May 10 and were ready for use at the beginning of August.

Lettuce.—Unrivalled and Nonpareil, sown April 30 in the garden, were ready for use in six weeks.

Radish.—Four varieties were tested but gave little satisfaction, as the white maggot spoiled the roots.

Onions.—Large Red Wethersfield, Yellow Danvers sown in the autumn at the end of October, gave a good return.

Carrots.—Chantenay, Guerande, Nantes, Danvers, all sown in the autumn, also succeeded well. The Danvers is the largest but is the least sweet. The Nantes is of good flavour but is smaller.

FLOWERS.

The following species and varieties were grown in hotbeds early in April: Asters, 6 varieties; antirrhinum, 2 varieties; *Phlox Drummondii,* alyssum, petunia, pot marigold and French marigold. They were transplanted to the garden the first week of June and commenced to flower at the end of June, and continued in bloom until the end of September. Six varieties of sweet peas sown in the open on April 2 also gave flowers for a very prolonged period, as did also three varieties of mignonette and twelve of pansies. The Sweet Williams were splendid. The German Iris have not yet flowered. The common lilac and Himalayan or rough-leaved Chinese lilac, *Syringa villosa* were full of flowers, giving a succession for six weeks.

BUSH FRUITS.

Thirty-six red currant bushes gave a very good yield, each bush producing on the average 5 gallons of excellent fruit, which ripened the first week of August.

ST. BRUNO, MACKENZIE DISTRICT (LATITUDE 60°).

St. Bruno is situated 20 miles west of Fort Smith on the banks of the Salt river or rather on the old river bed. The ground was broken in 1911. Some crops grown in 1914, with the results, are furnished by Father B. Roure.

Potatoes were planted on May 15 and dug on September 8. A half bag planted, yielded 10 large bags.

Carrots sown May 14 yielded 7 bags of fine roots, the largest weighing a pound each.

Beets sown the same time as the carrots were all good. The largest weighed 5 pounds.

There were 100 cabbages set out on June 4 and all made a good growth, the largest weighing 20 pounds.

Onions were well advanced, the largest weighing half a pound.

There were lettuce and radishes all summer.

Peas were ready for eating near the end of July.

We are satisfied with our little garden.

GROUARD.

FORT RESOLUTION (LATITUDE 61° 14′).

(The following report was sent by the Rev. Father Duport.)

The winter of 1913-14 was rough and long. It was not until the third week of May that the snow had entirely disappeared. As soon as the snow left the ground was prepared and between May 20 and 30 the different sowings were made under good conditions. Towards the second week of June a fine but abundant rain came and started germination and all the seeds planted with the exception of parsley started wonderfully and there was rapid growth. Numbers of explorers and officers of the government marvelled at the vegetation. August was not very warm and on the 18th some of our plants were affected with frost, but only slightly. From September 15 to the 20th the main harvest took place. On the night of the 22 and 23 the ground was frozen two inches in depth.

Following are some details:—

Variety.	Quantity sown.	Date of planting.	Germination.	Ready to use.	Ripe.	Weight, total.
						Lb.
Potatoes—						
Reeves Rose	4 rows 20 ft. long	May 22	June 14	August 25	Sept. 22	197
Rochester Rose	3 rows	" 22	" 14	" 15	" 22	85
Vick Extra Early	2 rows	" 22	" 16	" 15	" 22	80
Early Rose	4,100 lbs.	" 18 & 19	" 15–20	" 25	" 18–22	50,483
Beans—						
Early Red Valentine	1 row 20 ft.	" 22	" 18	" 10		
Wardwell Kidney Wax	"	" 22	" 18	" 10	(Did not mature.)	
Hodson Long Pod	"	" 22	" 24	Did not become ready.		
Peas—						
Gradus	"	" 23	" 8	August	Sept. 20	6
Nott Excelsior	½ row 10 ft.	" 23	" 8	"	" 20	5
Thos. Laxton	"	" 23	" 8	"	" 20	4
					Harvested.	
Cabbage—						
Early Jersey Wakefield	2 rows 20 ft.	" 23	" 4		Sept. 17	
Premium Flat Dutch	"	" 23	" 4		" 17	6 to 10
Early Winningstadt	"	" 23	" 4		" 17	4 to 8
Carrots—						
Danvers Half Long	3 x 20 feet	" 26	" 10		Sept. 29	47
Early Short	"	" 26	" 10		" 29	40
Chantenay	"	" 26	" 12		" 29	52
Danvers Improved	"	" 26	" 16		" 29	60
Beets—						
Early Blood Turnip	"	" 26	" 14		Sept. 23	80
Lettuce	"	" 26	" 8	June 25		
Parsley—						
Moss Curled	"	" 26				

FLOWERS.

Variety.	Date of sowing.	Germination.	Trans-planted.	Blooming season.
Alyssum	Self sown from previous year	Second week of May		Very abundant all summer.
Candytuft	Previous year	" "		" "
Poppies	"	" "		" "
Sweet Peas	Sown outside second week of May			Very abundant during Aug. and beginning of Sept.
Marigold	" "			" "
Phlox	" "			" "
Mignonette	" "			" "
Helichrysum	" "			" "
Aster	Sown under glass, April 20	May 15	June 8	Bloomed all month of Aug.
Stock	" "	" 15	" 8	" "
Verbena	" "	" 15	" 8	" "
Siberian Apple Tree	Year and a half	3 feet of growth		
Maple Tree	Three years	7 feet of growth		

Native Strawberries, cultivated for 3 years—yield from 30 plants, 2 gallons of fruit.

Notes in regard to Potatoes. The Reeves Rose, Rochester Rose, and Vick Extra Early potatoes were received in 1913 from the Experimental Station, Lacombe, Alta. They appear to have become readily acclimatized and their yield has been relatively as good as Early Rose. They are of good quality and size, but not very numerous. The Vick Extra Early is very early but rotted more easily in winter. The Reeves Rose appears to be the most profitable.

FORT RESOLUTION.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARM

REPORT

FROM

THE CEREAL DIVISION

FOR THE

Fiscal Year Ending March 31, 1915

PREPARED BY

Dominion Cerealist, Ottawa, Ont.	Chas. E. Saunders, B.A., Ph.D.
Superintendent—	
Experimental Station, Charlottetown, P.E.I.	J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S.	W. W. Baird, B.S.A.
Experimental Station, Kentville, N.S.	W. S. Blair.
Experimental Station, Fredericton, N.B.	W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière.	Joseph Bégin.
Experimental Station, Cap Rouge, P.Q.	Gus. A. Langelier.
Experimental Farm, Brandon, Man.	W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask.	T. J. Harrison, B.S.A.
Experimental Station, Rosthern, Sask.	Wm. A. Munro, B.A., B.S.A.
Experimental Station, Scott, Sask.	M. J. Tinline, B.S.A. (acting).
Experimental Station, Lethbridge, Alta.	W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta.	G. H. Hutton, B.S.A.
Experimentalist, St. Bernard Mission, Grouard, Alta.	Rev. Bro. Laurent.
Experimentalist, Grand Prairie, Alta.	S. J. Webb.
Experimentalist, Fort Vermilion, Alta.	Robert Jones.
Experimentalist, Fort Resolution, Mackenzie Dist.	
Experimentalist, Fort Providence, Mackenzie Dist.	
Experimental Farm, Agassiz, B.C.	P. H. Moore, B.S.A.
Experimental Station, Sidney, B.C.	Samuel Spencer (Foreman-Mgr.)

REPORT OF THE DOMINION CEREALIST

OTTAWA, March 31, 1915.

J. H. GRISDALE, Esq., B. Agr.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the twelfth annual report of the Cereal Division, giving a short account of the progress, during the past twelve months, of some of the investigations and experiments which are being prosecuted under my direction.

While the season of 1914 was much less favourable for cereals in some parts of the country than the previous year, there were excellent crops in many districts, and the experimental plots on the branch Farms and Stations gave interesting and instructive results.

Owing to the resignation of my chief assistant at the end of January, 1914, there was a vacancy on my staff for several months. In June, a new assistant, Mr. G. Gordon Moe, B.S.A., a graduate of Macdonald College, was appointed. Mr. Moe has taken up his work with enthusiasm and is rendering valuable help to me.

My thanks are due to all the members of my staff, without whose loyal co-operation the work could not be successfully carried on. Mr. R. W. Nichols, my milling and baking assistant, Miss Mary C. Carter, my stenographer, and Mr. George J. Fixter, my foreman, should be particularly mentioned. I am also under obligation this year to Mr. J. McKee of the Horticultural Division, who, by kind permission of Mr. W. T. Macoun, Dominion Horticulturist, conducted a large series of germination tests for me.

Following my own report will be found the reports on cereals written by the Superintendents of the various branch Farms and Stations.

I have the honour to be, sir,
Your obedient servant,

CHARLES E. SAUNDERS,
Dominion Cerealist.

CORRESPONDENCE.

The correspondence of the Cereal Division is carried on chiefly during the winter months. The figures as to the number of letters received and despatched during the whole year give very little idea of the amount of work which has to be transacted during the busy season.

Letters received direct	13,301
Letters received through other offices	7,834
Total letters received	21,135
Letters despatched, English	3,337
Letters despatched, French	474
Printed letters and circulars despatched	21,628
Total communications despatched	25,439

In order to reduce as much as possible the number of typewritten letters, printed replies are kept on hand, by means of which many hundreds of inquiries are answered every year.

VISITS TO BRANCH FARMS AND STATIONS.

All the branch Farms and all the Stations where cereal experiments are being carried on were inspected by the Dominion Cerealist last summer. Some of the new Stations were also visited in order to plan the work in cereals for future years.

As far as possible these visits of inspection are made during the period between the heading out of grain and the harvest, but in some seasons it is impossible to reach all the Stations at this favourable time.

Arrangements have been made to commence the regular test plots of cereals at Fredericton, N.B., and at Invermere, B.C., this spring.

MARQUIS WHEAT.

Still another triumph has been added to the long series won by this variety. At the International Dry-Farming Congress last autumn at Wichita, Kansas, the highest award for wheat was won by an exhibit of Marquis grown by Mr. Seager Wheeler, of Rosthern, Sask. This is the fourth international victory in succession won by Marquis. Not only has this variety taken the lead in Canada, but it has also made an excellent record in some of the northern states and is proving valuable at high altitudes in Colorado. It would be impossible to give a fair estimate of the value of this wheat to Canada—in dollars per annum—without appearing to exaggerate. It is certainly a question of millions.

PRELUDE AND PIONEER WHEATS.

While these two very early ripening varieties are not likely to mean as much to Canada as Marquis, they are proving valuable in certain sections of the country. The extraordinary earliness of Prelude enables it to escape frost in almost every locality where wheat-growing is attempted. It gives very fair yields, though of course it does not rival Marquis in this respect.

Pioneer is not quite so early as Prelude, but is a little longer in straw, which makes it suitable for some districts where the rainfall is light and where Prelude grows too short.

OTTAWA.

ABUNDANCE OATS.

In past years Abundance oats have been recommended as about equal in value to the old standard sort, Banner. Without endorsing any of the remarkable claims that have been made in favour of Abundance, it must be admitted that it has shown itself a very good variety. But after careful tests for several years on a number of farms, enough evidence has been accumulated to show that in spite of its excellent qualities this oat is not superior in any point to Banner, and is indeed usually a little inferior to it. The so-called "Regenerated Abundance" has not shown any material difference from the older stock. In my opinion, Abundance has now been sufficiently tested and may safely be dropped in favour of its great rival, Banner. A new variety which cannot show at least one point of decided excellence over the best of the old sorts has no just claim for recognition.

NUMBERS FOR NEW VARIETIES OF CEREALS.

The practice of numbering new varieties and selections of grain, instead of giving them names, when introducing them to the public, originated, I believe, at the Minnesota Experiment Station about twenty years ago. Since that time it has been adopted by other institutions and has now become quite popular. This system has obvious advantages from the point of view of the experiment station. It keeps the name and work of the Station well to the front and saves the trouble of choosing good names. The disadvantages are, however, very great. Numbers are always difficult to remember and easy to alter by mistake. Besides, when one is dealing with a selected strain of an old and well known variety of grain, it is quite unfair to the public—to say the least—to drop the original name of the variety, and thus hide the identity of the selected strain, which often differs scarcely at all from the parent sort.

For instance, a selection from the common kind of spring wheat, Blue Stem, was introduced under the name Haynes' Blue Stem. Such a designation was rational and satisfactory, retaining as it did the name of the variety and the name of the experimentalist who made the selection. But when a further selection was made from this and was introduced as "Minnesota No. 169," the fact that it was still essentially the old, familiar Blue Stem—with its serious defects of lateness and liability to rust —was obscured, and the public was given the false impression that a remarkable discovery of a new wheat had been made. Such a false impression was of course not intended, but it was inevitable in the system of numbering adopted. This latter objection is not applicable where an actual new variety, produced by cross-breeding, is being introduced; but even then the use of a number, without a name, is primitive and unsatisfactory.

Of late years these numbers have come into such general use that any institution which does not employ them is in danger of giving the impression that it has accomplished very little and has no new varieties or selections to its credit. It therefore seems necessary to adopt this system, in a modified form however, in connection with the cereal breeding work carried on at Ottawa by the Dominion Cerealist. The writer has assigned numbers to all the more important cross-bred varieties and selections which he has introduced. Some of these are of his own breeding, and all the others are his selections from earlier cross-bred sorts or from commercial varieties. These numbers are to be regarded as an addition to rather than a substitute for the names, which will be carefully retained.

In order to avoid an absurdly long designation, only the word "Ottawa" is prefixed to the number, the words "Central Experimental Farm Number" being understood. The numbers adopted do not follow each other regularly, because the system

of records for cross-bred varieties which has been in use for many years has indicated to a certain extent the numbers which should be adopted.

The following list includes all the sorts to which Ottawa numbers have thus far been assigned. A few of the varieties here mentioned have lately been dropped from the lists of recommended sorts, but they are all good. Many of them are the leading varieties before the public to-day:—

SPRING WHEAT.

Old Designation.	*New Designation.*
Alpha, Selected	Alpha, Ottawa 1.
Percy, Selection A	Percy, Ottawa 2.
Huron, Selected	Huron, Ottawa 3.
Preston, Selection H	Preston, Ottawa 4.
Stanley, Selection A	Stanley, Ottawa 5.
Bishop, Selection A	Bishop, Ottawa 8.
Chelsea	Chelsea, Ottawa 10.
White Fife, Selection C	White Fife, Ottawa 11.
Yellow Cross	Yellow Cross, Ottawa 14.
Marquis	Marquis, Ottawa 15.
Early Red Fife	Early Red Fife, Ottawa 16.
Red Fife, Selction H	Red Fife, Ottawa 17.
Early Russion	Early Russian, Ottawa 40.
Prelude	Prelude, Ottawa 135.
Pioneer	Pioneer, Ottawa 195.
OATS.	
Eighty Day, Selection B	Eighty Day, Ottawa 42.
Daubeney Selected	Daubeney, Ottawa 47.
Banner Selection B	Banner, Ottawa 49.
BARLEY, 6-ROW.	
Manchurian, Selection A	Manchurian, Ottawa 50.
BARLEY, 2-ROW.	
Early Chevalier	Early Chevalier, Ottawa 51.
SPRING RYE.	
Ottawa Select	Select, Ottawa 12.
WINTER RYE.	
Dominion	Dominion, Ottawa 13.
PEAS.	
Arthur Selected	Arthur, Ottawa 18.
FLAX.	
Longstem	Longstem, Ottawa 52.
Novelty	Novelty, Ottawa 53.

ORIGIN OF VARIETIES.

A few words of explanation in regard to the origin of some of the varieties seem desirable. About half of those mentioned are new cross-bred sorts, while the remainder are selections from old varieties.

Early Red Fife wheat is a distinct selection from Red Fife, easily recognized and ripening usually about a week before the ordinary type. Unfortunately this advantage is accompanied by a greater susceptibility to rust in some climates. However, Early Red Fife has an excellent record in the drier parts of Saskatchewan and Alberta.

Early Russian wheat is a selection from a variety of Russian origin. It is similar to White Russian in some respects but ripens earlier.

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The *Eighty Day oat* is a selection from the commercial oat commonly called Sixty Day or Orloff. The selected strain is fully as early as the parent. It ripens in about eighty days at Ottawa. It has short straw and small kernels but usually gives a very fair crop. It is of particular value in cases where great earliness is essential.

Manchurian barley is a selection from Mensury.

Early Chevalier barley is an early ripening strain selected out of French Chevalier.

Longstem is an unusually tall type selected out of common flax, and Novelty, which promises to give a very good yield of seed, is a selection from Novarossick.

Full descriptions of most of these Ottawa varieties and selections have been published in the previous annual reports of the Experimental Farms.

DISTRIBUTION OF SAMPLES OF SEED GRAIN AND POTATOES.

The annual distribution of free samples of seed grain and potatoes has been carried on as usual during the past winter. The grain for distribution was grown chiefly on the Experimental Farms at Indian Head, Sask., Brandon, Man., Ottawa, Ont., and Cap Rouge, Que. Owing to the dry weather at some of these farms the appearance of the grain was not quite so good as usual, but the wheat and peas received from Cap Rouge were very good, the peas in particular being remarkably plump and clean.

All the grain that was not plump and clean enough for distribution was graded and cleaned by various machines; and when any impurities were present which could not be removed by such treatment, the seed was hand-picked.

It is intended that all grain sent out shall be above criticism. In some cases, however, it is necessary to distribute seed which is not as plump and bright as we could wish, when no other seed of equal purity and of equally good pedigree is obtainable. The appearance of grain is sometimes a very poor guide as to its intrinsic value, and it is better that a farmer should be somewhat disappointed in the appearance of the sample he receives than that he should be seriously disappointed in the purity or vigour of his plot.

The number of samples distributed this year is considerably less than last season; because it was impossible (for various reasons) to accept as many as usual of the applications received late in the season. Although in the announcements of the distribution it is expressly stated that applications received after the end of January will probably be too late, many requests arrive in February and later months.

Farmers who desire to secure samples from this free distribution should apply preferably in November or December, and, to avoid delay, must give a clear statement of their needs, so that a suitable variety may be sent without further correspondence. Applicants for potatoes from other provinces than Ontario and Quebec are supplied from the branch Experimental Farms.

The following tables show the number of samples distributed from Ottawa:—

DISTRIBUTION Classified by Varieties.

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
Oats—		Spring Wheat—	
Banner	1,547	Marquis	806
Ligowo	281	Prelude	382
Daubeney	276	Red Fife	336
Eighty Day	42	Huron	248
Victory	35	Pioneer	121
		Early Red Fife	1
	2,181		1,894
Barley (six-row)—			
Manchurian	1,192	Peas—	
Success	34	Arthur	822
O. A. C. No. 21	24		
Barley (two-row)—		Potatoes—	
Canadian Thorpe	28	Green Mountain	1,070
Early Chevalier	6	Irish Cobbler	238
Gold	2		
			1,308
	1,286		

DISTRIBUTION Classified by Provinces.

—	Prince Edward Island	Nova Scotia	New Brunswick	Quebec.	Ontario.	Manitoba	Saskatchewan.	Alberta	British Columbia	Total.
Oats	14	64	39	548	262	122	683	376	73	2,181
Barley	1	35	24	265	125	117	365	293	61	1,286
Wheat	9	68	40	360	173	142	560	454	88	1,894
Peas	1	12	13	113	136	48	238	183	78	822
Potatoes				687	621					1,308
	25	179	116	1,973	1,317	429	1,846	1,306	300	7,491

SALE OF SEED GRAIN.

The Dominion Cerealist will be glad to furnish information as far as possible, to intending purchasers of seed grain, as to the nearest source of supply for good seed. Seedsmen and farmers in any part of Canada having seed grain for sale are advised to send their names, with a statement as to quantities, etc., and samples of the seed offered, to the Dominion Cerealist.

Most of the branch Experimental Farms have seed grain for sale, usually in limited quantity. There is also, frequently, a small surplus of seed at Ottawa after the free distribution has been finished, which is available for sale, usually in two-bushel lots.

OTTAWA.

VITALITY Tests of Seed Grain grown in 1914 at the Central Experimental Farm and at the Branch Experimental Farms.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Average Vitality.
CENTRAL EXPERIMENTAL FARM, OTTAWA.				
Spring Wheat	162	100	57	86
Emmer and Spelt	20	100	63	80
Oats	70	100	37	84
Rye	2	86	77	81
Field Peas	42	100	62	95
Beans	7	96	44	76
Flax	31	91	26	54
AGASSIZ, B.C.				
Barley	14	100	95	98
Oats	15	100	95	99
BRANDON, MAN.				
Spring Wheat	20	99	86	91
Barley	21	100	75	93
Oats	18	99	72	90
Peas	9	100	84	91
Flax	7	90	53	92
CAP ROUGE, QUE.				
Spring Wheat	1	......	......	85
Barley	1	......	......	96
Oats	1	......	......	88
Peas	1	......	......	88
CHARLOTTETOWN, P.E.I.				
Spring Wheat	11	95	83	90
Barley	20	99	90	97
Oats	13	100	88	95
Peas	4	90	80	82
FORT VERMILION, ALBERTA.				
Spring Wheat	8	100	97	99
Barley	5	100	99	99
Oats	5	99	88	93
Peas	1	......	......	98
Buckwheat	1	......	......	95
GROUARD, ALBERTA.				
Spring Wheat	2	99	60	79
Barley	1	......	......	98
Oats	2	92	89	90

OTTAWA.

VITALITY Tests of Seed Grain, etc.—*Concluded.*

INDIAN HEAD, SASK.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Average Vitality.
Spring Wheat	28	100	90	96
Barley	21	100	90	96
Oats	17	100	76	94
Rye	1	....	....	78
Peas	10	94	78	88
Flax	11	89	72	87

NAPPAN, N.S.

Spring Wheat	2	90	82	86
Barley	2	94	92	98
Oats	2	99	93	96
Buckwheat	1	....	....	89

ROSTHERN, SASK.

Spring Wheat	15	100	94	95
Barley	18	100	90	97
Oats	10	98	89	92
Peas	11	100	82	93

SCOTT, SASK.

Spring Wheat	12	100	78	91
Barley	7	94	83	88
Oats	8	94	74	83
Rye	1	....	....	77
Peas	4	96	62	74
Flax	1	....	....	73

OTTAWA.

MILLING AND BAKING TESTS.

In addition to the variety tests of the wheats grown at Ottawa and the branch Farms, a considerable amount of research work has been done in studying milling and baking processes. This includes experiments on blended flour, the effect of age on wheat and flour, the effect of different proportions of yeast, the "fineness" of flour, the amount of fermentation required, milling to different percentages of flour, etc., etc. The details of these experiments will be published in a separate bulletin.

A bread mixer driven by an electric motor has been installed during the year and an electric drying oven for the estimation of moisture in flour has been in use during the past season.

The following figures give an idea of the extent of the tests carried on:—

Milling Tests—	
Named varieties grown at Ottawa, 1914	18
Numbered varieties grown at Ottawa, 1914	48
Varieties grown at Branch Experimental Farms, 1914	53
Samples received from farmers	1
Storage experiments	3
Total	123
Baking Tests—	
Named varieties grown at Ottawa, 1914	18
Numbered varieties grown at Ottawa, 1914	48
Varieties grown at Branch Experimental Farms, 1914	53
Wheat samples received from farmers	1
Samples received in the form of flour	16
Commercial flours tested	34
Storage experiments	15
Total	185
Number of loaves made in studying milling and baking processes	416
Total number of loaves made	1,050

OTTAWA.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

The following pages of this section of the report deal with the work in cereals as carried on at Ottawa under the immediate supervision of the Dominion Cerealist.

WEATHER.

The season of 1914 was rather unfavourable for the best results with cereals. The spring and early summer were very dry, there being scarcely any important showers from the end of April until nearly the end of June. This prevented a uniform germination of seed grain, while smaller seeds, such as flax, suffered most severely. Light showers accompanied with intense heat characterized the remainder of June and the larger part of July. Although the harmful effects of the beginning of the season were somewhat alleviated, the extreme heat of July injuriously hastened the ripening of the very early maturing grains before they had attained full development. Cooler weather with light showers prevailed throughout the remainder of July and August. This permitted the medium and late varieties under test to mature a fair yield of grain of good quality. Harvesting was accomplished with ease and rapidity. Although at no time during the summer was the rainfall ample, yet the even distribution of the showers after the middle of June resulted in larger yields of all classes of grain than would have been anticipated from appearances in the early part of the season.

PLOTS OF CEREALS, ETC., AT OTTAWA.

In 1914 there were sown at Ottawa 640 small plots of cross-bred varieties not yet fixed in character, and 402 small plots of new varieties and selections which have been found to propagate true to type and are now being increased for test on a larger scale.

The regular test plots of grain, for the comparison of varieties, are one-sixtieth of an acre each. The number of plots of this size, last season, was as follows: Spring wheat 168, emmer and spelt 28, oats 67, spring rye 2, field peas 42, field beans 6, flax 31, making a total of 344 plots, and representing about 330 varieties and selected strains.

The total number of plots of all sizes was 1,386.

Owing to the shortage of land for the Cereal Division, the regular test plots for varieties of barley had to be omitted.

EXPLANATION OF TABLES.

In the following tables a discrepancy may be observed in some cases between the figure given as the number of days maturing and that which is obtained by counting the days between the date of sowing and the date of ripening. When any varieties have been sown later or earlier than the majority, it has been found necessary to introduce a correction, because, owing to the great difference between spring and mid-summer temperatures, a difference of a few days in sowing does not produce a corresponding difference in time of ripening.

The character of the straw is indicated by marks on a scale of ten points, according to the proportion of the plot standing erect at harvest time. A variety standing quite erect receives a mark of 10, while one completely lodged is marked 0.

As a rule, only named varieties are mentioned in the tables. Most of the varieties under test are new cross-bred sorts produced by the Dominion Cerealist and recorded for the present by means of numbers and letters. As soon as the value of these sorts has been determined, names will be given to such of them as possess sufficient merit to warrant their introduction to the public.

SPRING WHEAT.

One hundred and forty-five varieties and selected strains of spring wheat were tested in the regular one-sixtieth acre trial plots at Ottawa. The wheat was sown from the 5th to the 9th of May, the seed being used at the rate of about one and one-half bushels per acre. Cutting commenced on July 25, Prelude being, as usual, the first variety harvested.

Considering the very dry character of the season as a whole, the yields of spring wheat were good, reaching as high as 43 bushels per acre in the case of two of the new cross-bred varieties not yet named.

Burgoyne's Fife, a new English variety, was tested last season for the first time. It stands 140th on the list (including the numbered sorts). It ripened 28 days later than Prelude and 6 days later than White Russian. It is therefore to be classed as an extra late variety when sown as a spring wheat.

Those sorts which have a letter or an Ottawa number after the name are new varieties or selections produced by the Dominion Cerealist.

Spring Wheat, Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days maturing (corrected)	Average length of straw, including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.		Weight per measured bushel after cleaning
					Inches		Inches.	Lb.	Bu.	lb.	Lb.
1	Yellow Cross Beardless A..	May 6	Aug. 9..	94	44	5	3·0	2,130	35	30	64·5
2	Pringle's Champlain C.....	" 5	" 9..	95	42	9	3·5	2,010	33	30	63·3
3	White Russian C...	" 6	" 16..	101	46	7	4·0	2,010	33	30	62·0
4	White Russian D	" 6	" 16..	101	46	8	4·0	1,980	33	00	62·4
5	Red Fern C.	" 5	" 12..	98	44	10	4·0	1,800	30	00	64·1
6	Red Fern B...............	" 5	" 12..	98	44	10	4·0	1,710	28	30	63·5
7	Pioneer, Ottawa 195......	" 5	July 30..	85	36	10	3·5	1,680	28	00	63·1
8	Hungarian White B	" 5	Aug. 7..	93	40	10	3·5	1,650	27	30	63·4
9	Yellow Cross Beardless B..	" 6	" 9..	94	44	6	3·0	1,650	27	30	63·3
10	Huron, Ottawa 3.....	" 5	" 10..	96	38	10	3·7	1,620	27	00	63·4
11	Marquis, Ottawa 15.	" 5	" 9..	95	38	10	3·5	1,620	27	00	63·6
12	Prelude, Ottawa 135.......	" 5	July 25	80	32	10	2·2	1,620	27	00	65·4
13	Stanley, Ottawa 5... ...	" 5	Aug. 14..	100	46	9	3·7	1,620	27	00	61·0
14	Chelsea, Ottawa 10...	" 5	" 3..	89	38	10	3·5	1,590	26	30	62·0
15	White Fife, Ottawa 11. ..	" 5	" 19..	105	41	10	3·7	1,560	26	00	62·2
16	Onega A	" 5	July 28..	83	36	10	2·5	1,530	25	30	57·3
17	Hungarian White D.......	" 5	Aug. 7..	93	40	10	3·5	1,500	25	00	63·0
18	Early Russian, Ottawa 40.	" 5	" 3..	89	40	9	3·5	1,470	24	30	63·4
19	Red Fife, Ottawa 17......	" 5	" 19.	105	41	10	3·7	1,440	24	00	62·6
20	Early Red Fife, Ottawa 16	" 5	" 9..	95	38	10	3·5	1,410	23	30	63·1
21	Bishop, Ottawa 8....	" 5	" 5..	91	36	10	3·0	1,380	23	00	62·0
22	Bobs	" 5	" 2..	88	34	10	3·2	1,380	23	00	62·5
23	Goose................	" 5	" 5..	91	40	10	2·2	1,260	21	00	64·2
24	Kubanka B...	" 5	" 12..	98	40	8	2·2	1,050	17	30	63·5
25	Burgoyne's Fife...... ..	" 5	" 22..	108	38	10	3·7	990	16	30	57·5
26	Huguenot B....	" 5	" 7..	93	42	10	2·5	960	16	00	58·8
27	Kubanka A...........	" 5	" 12..	98	40	8	2·2	900	15	00	64·0
28	Huguenot A.	" 5	" 7..	93	42	10	2·5	840	14	00	59·5

RECOMMENDED VARIETIES OF SPRING WHEAT.

For Ontario and Quebec.—Huron, very productive, early ripening, bearded, giving flour of fair baking strength. Marquis and Early Red Fife, early ripening, beardless, giving flour of very high baking strength. Red Fife and White Fife rather late in ripening, beardless, giving flour of very high strength. The extremely early

ripening variety Prelude will be useful in some northern localities. It is an excellent variety but should not be expected to give a very large yield. It is not adapted for dry districts.

For the Maritime Provinces.—Red Fife and White Fife are very good. If early sorts are required, Huron and Marquis are recommended. White Russian is popular. It gives a large yield, but is of poor quality for bread-making.

For Manitoba and Saskatchewan.—Marquis is the best variety for most districts. Red Fife is excellent for localities where there is no danger of early frosts. For districts where extreme earliness is required and where there is sufficient rainfall to produce a good length of straw, the new variety Prelude is highly recommended. Pioneer, another new and very early ripening sort should be given a trial if the conditions are too dry for Prelude.

For Alberta.—Red Fife is perhaps the best sort for some of the dry areas towards the south, but, wherever there is sufficient rainfall, Marquis should be tried. If early-maturing varieties with longer straw than Marquis are essential, Huron or Early Red Fife should be tested. Pioneer, a new variety recently introduced by the Dominion Cerealist, ripens earlier than any of the above-mentioned sorts, and has given good results under dry conditions. It is bearded and produces straw which is usually of fair length. It is not adapted to moist districts. For all localities where the tendency is towards the production of excessively long straw and where a very early-ripening wheat is required, Prelude is unquestionably the best variety known.

For British Columbia.—Huron is one of the best varieties. Red Fife and Marquis may not generally give quite such large crops but they are more popular for bread-making. Prelude or Pioneer may be useful in a few localities where extreme earliness is essential.

EMMER AND SPELT.

The plots of emmer and spelt were sown on the 11th and 12th of May, the seed being used at the rate of about one hundred and twenty pounds (or four bushels by measure) to the acre.

Twenty-three varieties were tested, most of them being new cross-bred sorts produced by the Dominion Cerealist. Only the named sorts are here reported upon.

Common Emmer—often incorrectly called "Speltz"—is one of the best varieties. However for most districts, under ordinary conditions of farming, it has not proved as valuable as the more common cereals, and its use is therefore not advised.

EMMER AND SPELT.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Date of Maturing.	Average Length of Straw including Head.	Strength of Straw on a Scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Weight per Measured Bushel after Cleaning.
					Inches.		Inches.	Lb.	Lb.
1	Red Emmer	May 11	Aug. 25	106	48	10	3·5	3000	39·5
2	Smooth Spelt	" 11	" 25	106	45	10	4·5	2940	32.5
3	Common Emmer	" 11	" 17	98	38	6	2 2	1770	35·5
4	Double Emmer	" 11	" 9	90	36	2	1·5	1320	30·0

OTTAWA.

OATS.

Sixty-seven varieties of oats were sown in the regular test plots. The dates of sowing were from the 13th to the 15th of May. The seed was used at the rate of about two bushels per acre, except when the oats were unusually large, when about one-fourth or one-half as much seed again was used.

The first variety to be cut was Eighty Day which ripened on July 28 only 75 days from the date of sowing. The excessive drought was particularly unfavourable to early varieties.

Those sorts which have a letter or an Ottawa number after the name are selected strains produced by the Dominion Cerealist. Thirty new cross-bred sorts, which have not yet been named, are omitted from the table.

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Average Length of Straw including Head.	Strength of Straw on a Scale of 10 points.	Average Length of Head.	Yield of Grain Per Acre.	Yield of Grain Per Acre.		Weight per Measured Bushel after Cleaning.
					Inches.		Inches.	Lb.	Bush.	lb.	Lb.
1	Victory........	May 14	Aug. 13	91	38	10	7·0	2580	75	30	37·7
2	Danish Island.....	″ 13	″ 17	95	40	10	7·5	2490	73	8	36·1
3	Quebec B.	″ 14	″ 10	88	33	10	6·0	2220	65	10	35·0
4	Irish Victor.......	″ 14	″ 17	95	40	10	7·0	2160	63	18	34·7
5	Pioneer.	″ 14	″ 10	88	34	10	7·0	2160	63	18	35·6
6	Early Blonde.......	″ 14	″ 12	90	40	7	7·0	2130	62	22	32·4
7	Quebec A.	″ 14	″ 13	91	33	10	6·0	2130	62	22	33·9
8	Sib rian.	″ 14	″ 10	88	40	10	6·5	2070	60	30	38·2
9	Ligowo Swedish...	″ 14	″ 17	95	38	10	7·1	2040	60	.	35·6
10	Twentieth Century	″ 14	″ 17	95	38	10	7·0	2040	60	..	38·4
11	Banner M...	″ 13	″ 10	88	33	10	7·5	1980	58	8	39·1
12	Banner, Ottawa 49.	″ 13	″ 13	91	36	10	6·0	1950	57	12	36·3
13	American Beauty B.	″ 13	″ 17	95	34	10	5·7	1920	56	16	36·4
14	American Beauty C	″ 13	″ 13	91	34	10	5·7	1890	55	20	37·4
15	Banner J...	″ 13	″ 17	95	36	10	6·0	1860	54	24	34·9
16	Banner L..........	″ 13	″ 10	88	33	10	7·5	1860	54	24	39·1
17	Banner K....	″ 13	″ 10	88	33	10	7·5	1830	53	28	38·5
18	Garton's No. 22 ..	″ 14	″ 7	85	35	10	6·5	1800	52	32	35·4
19	Swedish Black ...	″ 14	July 30	77	43	7	8·0	1740	51	6	31·4
20	Tartar King.	″ 14	Aug. 13	91	38	10	8·0	1740	51	6	30·1
21	Abundance D......	″ 13	″ 26	104	38	9	8·0	1710	50	10	34·0
22	O.A.C. No. 72.... .	″ 14	″ 17	95	40	10	7·0	1710	50	10	35·4
23	Quebec C..	″ 14	″ 10	88	36	10	6·0	1710	50	10	33·2
24	Alpine.............	″ 13	″ 17	95	40	7	7·5	1680	49	14	33·2
25	Swedish Select.....	″ 14	″ 13	91	38	10	7·0	1680	49	14	40·2
26	Gold Rain.	″ 14	″ 4	82	32	10	6·0	1620	47	22	38·4
27	Excelsior....	″ 14	″ 8	86	36	10	7·0	1590	46	26	38·8
28	Daubeney, Ottawa 47.........	″ 13	July 29	76	30	10	5·0	1530	45	..	31·1
29	Green Mountain....	″ 14	Aug. 12	90	38	10	7·0	1530	45	..	37·7
30	Abundance (Garton's Regen)., ...	″ 13	″ 26	104	38	7	8·0	1500	44	4	34·5
31	Eighty Day, Ottawa 42..	″ 14	July 28	75	30	10	5·0	1470	43	8	29·6
32	Abundance A......	″ 13	Aug. 22	100	38	8	8·0	1440	42	12	33·5
33	Black Mesdag.	″ 13	″ 5	83	35	9	7·0	1440	42	12	36·0
34	Bergs....	″ 13	″ 9	87	36	10	7·0	1380	40	20	37·6
35	Early Ripe E	″ 14	July 29	76	33	10	4·0	1380	40	20	30·0
36	Early Ripe F	″ 14	″ 29	76	33	10	4·0	1260	37	2	26·6
37	Early Ripe G......	″ 14	″ 29	76	33	10	4·0	1200	35	10	28·2

RECOMMENDED VARIETIES OF OATS.

Among the most productive varieties of white oats, Banner is especially recommended. Ligowo is somewhat earlier in ripening, but does not generally give quite so large a yield as Banner. Gold Rain is a very productive yellow oat. Black oats are not recommended, but Pioneer and Excelsior may be mentioned as two of the best sorts.

Farmers who require an extremely early-ripening variety should try Eighty Day, Orloff, or Sixty Day. The name Sixty Day is misleading, as this oat is not earlier than the other two. Daubeney is another similar sort, almost as early as Eighty Day, but producing somewhat longer straw and slightly larger kernels. All these oats are, however, small.

BARLEY.

Owing to shortage of land, the regular variety tests of barley could not be made this season.

RECOMMENDED VARIETIES OF SIX-ROW BARLEY.

Among the most productive six-row barleys are Manchurian and Odessa. Manchurian is a selection from Mensury. O.A.C. No. 21, is also a very good selection, similar in character to Manchurian.

The beardless (or "hooded") types of barley at present available in commerce are not very satisfactory. Success and Champion are two of the best kinds. They are both early in ripening; but their straw is not very strong, and they generally give rather a small yield.

The common sorts of hulless barley are Hulless White (beardless) and Hulless Black (bearded). These are characterized by weak straw.

RECOMMENDED VARIETIES OF TWO-ROW BARLEY.

Among the best varieties of two-row barley may be mentioned Duckbill, Goldthorpe, Canadian Thorpe, and some of the strains of Chevalier, especially Early Chevalier if an early ripening sort is desired.

No satisfactory varieties of beardless or hulless two-row barley are yet available. The Dominion Cerealist is experimenting with a number of new cross-bred sorts of his own production.

SPRING RYE.

Two strains of spring rye were sown on the 19th of May, the seed being used at the rate of about one and one-half bushels per acre.

SPRING RYE.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Average length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lb.	Bu.	Lb.	Lb.
1	Select, Ottawa 12	Aug. 19	92	48	8	3·5	2,010	35	50	56·0
2	Common	" 19	92	50	8	3·5	1,860	33	12	57·2

OTTAWA.

FIELD PEAS.

Forty-one plots of field peas were sown on the 12th and 13th of May. The seed was used at the rate of about two bushels per acre in the case of small peas and three bushels when the peas were large. The extremely dry weather caused considerable irregularity in the yields. Arthur, Ottawa 18, which is one of the best sorts, did not give good returns this year, as the plot was in an unfortunate position.

Only the named varieties are mentioned in the table. Twenty-seven numbered sorts are omitted.

PEAS.—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Ripening.	Number of days Maturing.	Average length of Straw.	Average length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
					Inches.	Inches.	Lb.	Bush.	lb.	Lb.
1	Mackay	Large	Aug. 25	105	62	2·5	2,910	48	30	64·4
2	Prussian Blue	Medium	" 19	99	50	2·2	2,730	45	30	66·0
3	Picton	"	" 24	104	50	2·2	2,580	43	00	64·5
4	Paragon	Large	" 26	106	50	2·5	2,550	42	30	64·3
5	Prince	"	" 24	104	50	2·0	2,550	42	30	65·0
6	Solo	"	" 19	99	55	2·5	2,220	37	00	63·9
7	White Marrowfat	"	" 27	107	75	2·5	1,920	32	00	65·3
8	English Grey	"	" 26	106	58	2·0	1,890	31	30	63·4
9	Golden Vine	Small	" 20	100	63	2·2	1,890	31	30	66·0
10	Wisconsin Blue	Medium	" 26	106	65	2·2	1,800	30	00	65·0
11	Daniel O'Rourke	Small	" 26	106	60	2·0	1,740	29	00	65·8
12	Black-eye Marrowfat	Large	" 26	106	48	2·2	1,650	27	30	64·5
13	Arthur, Ottawa 18	Medium	" 12	92	48	2·2	1,410	23	30	66·0
14	Chancellor	Small	" 10	90	50	2·0	1,050	17	30	65·2

RECOMMENDED VARIETIES OF FIELD PEAS.

Among the best sorts which are available to the public may be mentioned Prussian Blue, Arthur and Golden Vine. Golden Vine is a small, yellow pea. Arthur is yellow, of medium size, and earlier in ripening than most other sorts.

FIELD BEANS.

Five plots, one-sixtieth of an acre each, were sown with field beans on May 26. Very late maturing sorts are not included in these tests. The beans were all sown in rows 16 inches apart.

FIELD BEANS.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Average length of Plant.	Average length of Pod.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.	Inches.	Lb.	Bush.	lb.	Lb.
1	Norwegian Brown, selected	Sept. 1	98	15	4·5	3,660	51	00	61·4
2	Golden Wax, selected	" 1	98	15	3·7	2,460	41	00	64·7
3	California Pea, selected	" 5	102	14	3·7	1,950	32	30	65·5
4	Stringless Kidney Wax, selected	" 5	102	12	4·0	1,710	28	30	61·2
5	Challenge Black Wax, selected	Aug. 22	88	12	3·0	1,650	27	30	58·5

FLAX.

Thirty-one selected strains of flax were grown in the regular test plots. The seed was sown from the 13th to the 15th of May at the rate of about 60 pounds per acre. Owing to the severe drought in spring and early summer, the germination of the flax was very irregular and the growth unsatisfactory. The crop was quite small in most cases.

All the strains under test were selected at Ottawa.

FLAX—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.		Date of Ripening.		Number of days maturing.	Average length of Plants.	Yield of seed per acre.	Yield of seed per acre.		Weight per measured bush. after cleaning.
							Inches.	Lb.	Bush.	lb.	Lb.
1	Novelty, Ottawa 53...	May,	14	Sept.	1	110	24	900	16	4	53.0
2	White, E 1A	"	14	"	1	110	20	840	15	..	53.3
3	White, E 3............	"	14	Aug.	26	104	23	780	13	52	53.6
4	Foremost B......... .	"	13	"	26	104	26	750	13	22	54.2
5	White E 1 B..	"	14	Sept.	1	110	18	750	13	22	52.2
6	White D 3	"	14	"	1	110	18	690	12	18	53.1
7	White E 2..........	"	14	Aug.	26	104	23	690	12	18	54.2
8	Common A..........	"	13	"	25	103	28	630	11	14	55.2
9	" D..........	"	13	"	25	103	26	630	11	14	55.1
10	White Flowering A...	"	14	Sept.	1	110	24	630	11	14	54.0
11	Riga C....	"	14	Aug.	26	104	26	600	10	40	55.4
12	Russian A............	"	14	"	26	104	26	600	10	40	55.8
13	White A....	"	14	"	26	104	20	600	10	40	53.4
14	Common C............	"	13	"	25	103	28	570	10	10	55.1
15	Foremost C...........	"	13	Sept.	1	110	24	570	10	10	54.7
16	White Flowering B..	"	14	"	1	110	24	570	10	10	53.8
17	Yellow Seed A	"	15	"	1	110	27	570	10	10	53.6
18	Common B..........	"	13	Aug.	25	103	28	540	9	36	55.2
19	Riga B..............	"	14	"	26	104	28	540	9	36	55.0
20	Foremost A.....	"	13	"	26	104	38	510	9	6	54.2
21	Riga A..............	"	14	"	30	108	30	510	9	6	54.9
22	Russian B..	"	14	"	27	105	30	510	9	6	55.0
23	White D 1............	"	14	Sept.	1	110	18	510	9	6	52.8
24	La Plata B...........	"	13	Aug.	31	109	18	480	8	32	52.0
25	" C..........	"	14	Sept.	8	117	18	480	8	32	53.1
26	White C..............	"	14	Aug.	30	108	20	480	8	32	52.5
27	Yellow Seed B... ..	"	15	Sept.	1	110	27	480	8	32	53.4
28	White B..........		14	Aug.	26	104	20	450	8	2	54.6
29	Yellow Seed C...	"	15	Sept.	3	112	27	420	7	28	54.0
30	La Plata A...... .	"	13	"	8	117	20	390	6	54	52.5
31	Longstem, Ottawa, 52.	"	14	"	1	110	36	390	6	54	54.0

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

J. A. CLARK, B.S.A., SUPERINTENDENT.

SEASONAL NOTES.

The ground had been well covered with snow during the winter of 1913-14. March was mild but during April and the first half of May the weather was cold and vegetation very backward. Seeding commenced May 18, but was greatly delayed by frequent showers, cold nights and the absence of any really hot days. July and August were favourable months. All grain was late ripening, Daubeney oats being the first cut August 20. The first and third weeks of September were unusually hot, the thermometer rising several degrees higher than any previous day during the summer, insuring the quality of the greatest harvest of many years in this province.

CEREAL AREA.

The land available for the cereal division lies between the Mount Edward road on the east, the Prince Edward Island railway on the west, the St. Avards road on the north and the boundary of the Station property on the south. A three-year rotation was started on this area in 1913. Certain areas, however, were found to be unsuitable for variety tests and will be used for multiplying plots and decoying birds away from the test areas. In order to test in duplicate the desirable varieties of cereals on this land it became necessary to adopt a rotation that would produce more grain than the one mentioned in 1913. The following four year rotation has been devised to meet necessary conditions:—

First year.—Hoed crop. Manured 12 tons per acre.

Second year.—Wheat and barley plots, seeded down with 10 pounds of red clover, 2 pounds of alsike and 5 pounds timothy.

Third year.—Clover hay, manured 8 tons per acre, after hay is removed, and ploughed under.

Fourth year.—Oat plots, seeded down with 8 pounds red clover and 2 pounds of alsike.

UNIFORM TEST PLOTS OF CEREALS.

The season was most favourable for cereals, and the crops in general quite equalled the banner year of 1910. The uniform tests were sown in duplicate in one-sixtieth acre plots as follows:—

Spring wheat, May 20; oats, May 22; barley, May 30.

Scarcely any stinking smut was observed. All heads of loose smut were hand picked as soon as they appeared. This has greatly decreased the percentage of this troublesome disease.

Rogueing was continued throughout the season.

The seed was obtained from hand-selected heads taken from the 1913 plots except the following new strains that were received from the Cerealist at Ottawa: Banner, Ottawa 49 oats, Marquis, Ottawa 15 wheat, and Early Chevalier, Ottawa 51 barley, and one lot received from the Ontario Agricultural College, known as O. A. C. No. 72 oats. The paths and roads were all seeded with grass and clover the same as the plots. The hay from the paths was removed early in August.

EXPERIMENTS WITH SPRING WHEAT.

All plots made strong growth. Green aphis was very numerous for a time on the heads of wheat. Parasites, however, apparently destroyed the aphis and prevented any serious injury.

SPRING WHEAT.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of Grain per acre.	Yield of Grain per acre.		Weight of Measured Bushel after Cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Chelsea	May 20	Sept. 1.	104	47	9·5	3·7	3,193	53	13	63·8
2	Early Red Fife	" 20	" 2.	105	50	10·0	3·2	3,099	51	39	63·7
3	Huron	" 20	" 4.	107	50	10·0	3·0	2,550	42	30	64·3
4	Stanley	" 20	" 7.	109	48	10·0	3·5	2,159	35	39	62·0
50	Marquis	" 20	" 1.	104	40	9·5	2·7	1,981	33	1	64·0
6	Red Fife	" 20	" 7.	109	47	10·0	2·7	1,838	30	38	63·0
7	378 A	" 20	" 1.	104	46	9·0	3·5	1,849	30	49	62·6
8	White Fife	" 20	" 5.	107	46	10·0	3·0	1,416	23	36	62·8
9	White Russian	" 20	" 5.	107	44	10·0	3·5	1,410	23	30	62·0
1	86 D 2	" 20	" 1.	104	41	9·5	2·7	1,166	19	26	62·7

Plot B Marquis was very much affected by couch, about one-half being almost totally killed out.

EXPERIMENTS WITH OATS.

The seed was treated with formalin at the rate of one pint of formalin to forty gallons of water. More than one-half of the area sown with oat plots was badly infested with couch grass that greatly lessened the yields. A dead furrow happened to run the full length of the duplicate plots of Banner oats, destroying the value of the test. The injury could not be estimated and the actual yields are recorded.

Oats.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of Grain per acre.	Yield of Grain per acre.		Weight of Measured Bushel after Cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Victory	May 22	Sept. 5	106	54	6·0	7·7	4,072	119	26	39·4
2	O.A.C. No. 72	" 22	" 4	105	60	6·0	9·0	4,039	118	27	36·1
3	Lincoln	" 22	" 3	104	50	3·5	8·5	3,987	117	9	37·5
4	Gold Rain	" 22	" 4	105	51	4·0	8·0	3,912	115	2	40·8
5	Ligowo	" 22	" 3	104	52	1·5	8·2	3,855	113	13	39·0
6	Old Island Black	" 22	Aug. 28	98	51	5·0	9·0	2,476	74	18	35·6
7	Pioneer	" 22	" 28	98	36	9·5	7·0	1,809	72	28	36·8
8	Norway	" 22	Sept. 1	102	48	6·0	7·5	2,424	71	10	34·0
9	Early Blossom	" 22	" 2	103	45	8·5	7·0	2,304	67	26	38·0
10	Swedish Select	" 22	" 2	103	46	8·2	7·0	2,081	61	7	40·1
11	Daubeney	" 22	Aug. 20	90	41	7·5	7.0	1,930	56	26	30·6
12	Siberian	" 22	Sept. 2	103	48	9·5	8·0	1,809	53	7	38·1
13	Banner	" 22	" 2	103	42	10·0	7·5	1,752	51	18	37·1
14	Abundance	" 22	Aug. 31	101	47	9·0	7·0	1,725	50	25	39·4
15	Twentieth Century	" 22	Sept. 2	103	43	9·0	7·2	1,685	49	19	39·4

Plots of Siberian, Swedish Select, Twentieth Century, Pioneer and Old Island Black, badly injured by couch; both plots of Banner injured by couch, and they had a dead furrow throughout the whole length of each plot.

Charlottetown.

EXPERIMENTS WITH BARLEY.

The plots of barley were on land much more uniform than the other cereals and the test is relatively more valuable. The Old Island two-row (English Chevalier), favourably mentioned last year, again deserves special mention as the character of dropping its awns in the field is becoming more fixed.

The plots of barley were sown on the 30th of May.

BARLEY—Test of Varieties.

Number.	Name of Variety.	Six-row or two-row.	Date of Ripening.	Number of days maturing.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.		Weight of measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	lb.	Lb.
1	Island Two-row......	2	Sept. 7	100	37	8·0	3·5	3,999	83	15	55.1
2	Gold..............	2	" 7	100	35	8·0	2·7	3,953	82	17	55.4
3	Trooper............	6	" 2	95	45	9·5	3·0	3,899	81	11	51.0
4	Stella........	6	" 1	94	45	9·5	3·0	3,808	79	16	51.3
5	Hannchen.......	2	" 6	99	38	5·0	3·0	3,757	78	13	54.2
6	Swedish Chevalier...	2	" 7	100	39	6·0	3.5	3,557	74	5	53.0
7	Albert.........	6	" 1	94	39	7·5	3·0	3,420	71	20	48.6
8	O. A. C. No. 21...	6	" 1	94	43	9·2	2·7	3,404	70	44	48.9
9	Nugent..........	6	" 1	94	43	9·5	2·7	3,373	70	13	49.8
10	Canadian Thorpe....	2	" 6	99	43	9·2	3·0	3,369	70	9	53.4
11	Manchurian........	6	" 1	94	42	8·5	3·0	3,328	69	16	51.0
12	Oderbruch.......	6	" 1	94	44	9·5	3·0	3,326	69	14	51.3
13	Invincible..........	2	" 7	100	40	9·0	3·0	3,138	65	18	55.0
14	Odessa...........	6	" 1	94	42	9·0	2·5	3,137	65	17	51.0
15	Clifford...........	2	Aug. 28	90	45	9·0	4·0	3,129	65	9	53.6
16	Early Chevalier.....	2	" 24	86	40	8·0	3·0	3,119	64	47	53.4
17	Standwell.........	2	" 25	87	48	10·0	3·2	3,097	64	25	54.5
18	Beaver...........	2	Sept. 1	94	54	9·5	4·5	3,538	52	42	52.0

EXPERIMENTS WITH PEAS.

The cold backward season was against the early ripening of the peas. A very large green aphis attacked the peas in great numbers in August. We immediately sprayed them with kerosene emulsion which killed most of the insects and checked the attack so that no further damage was done. A considerable amount of injury was done by the pea weevil.

PEAS—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured bushel after Cleaning.
						Inches.	Inches.	Lb.	Bush.	lb.	Lb.
1	Solo..............	Medium	May 30	Oct. 3	126	105	2·7	1,797	29	57	62·5
2	Arthur...........	Large..	" 30	Sept. 15	108	60	2·2	1,564	26	4	65·0
3	Golden Vine.......	Small...	" 30	" 28	121	90	2·0	1,222	20	22	65·1

CHARLOTTETOWN.

FIELD PLOTS OF CEREALS.

The demand for registered seed from this Station is now much greater than can be supplied owing to the limited area of land for this purpose. These multiplying plots are grown on the regular farm rotations which, though much more uniform than they have been in the past, still vary greatly in soil and fertility as shown by the two fields of Banner oats sown with the same seed. The grain was saved in excellent condition and gave a very high germination test, several varieties giving 100 per cent strong germination.

These plots were carefully rogued twice during the season.

Multiplying Plots of Cereals.

Spring Wheat.

Variety.	Field.	Preceding crop.	Acreage.	Yield per acre. Bush.	Yield per acre. Lb.
Marquis	B—5	Turnips	1·0	28	25
Marquis	F—4	Turnips	0·86	18	47
Red Fife	D—3	Potatoes	1·0	14	12
		Average	....	20	28

Oats.

Variety.	Field.	Preceding crop.	Acreage.	Yield per acre. Bush.	Yield per acre. Lb.
Banner	A—5	Mangels	1·0	83	27
Banner	B—2	Clover hay	1·0	50	10
Banner	Connolly field.	Oats	8·0	35	9
Ligowo	G—1	Corn	0·4	66	8
Old Island Black	C—4	Corn	0·57	63	33
Daubeney	G—6	Hay	0·4	47	19
Victory	Haszard field.	Pasture	3·0	35	32
		Average	....	54	24

Barley.

Variety.	Field.	Preceding crop.	Acreage.	Yield per acre. Bush.	Yield per acre. Lb.
Gold	F—2	Hay	0·86	57	13
Manchurian	A—3	Hay	1·0	50	2
		Average	....	53	31

Charlottetown.

CO-OPERATIVE TEST OF THREE VARIETIES OF OATS.

The co-operative test of oats begun in 1912 was continued. The same three varieties were tested in duplicate plots of one-sixtieth acre each on two of the original farms and one new one, which are mentioned below. Mr. Garnet LeLacheur, Seed Inspector, and Mr. Wilfred Davison, Provincial Field Husbandman, furnished the field notes and took supervision of the field work. The grain was forwarded to the Experimental Station where it was threshed, graded and weighed.

Co-operative test of plots of oats:—Test of Banner, Ligowo and Old Island Black Oats in Queens and Kings counties. The average of duplicate plots is here given.

Name of Experimenter.	Location.	Yield per acre.					
		Banner.		Ligowo.		O. I. Black.	
		Bush.	lb.	Bush.	lb.	Bush.	lb.
Mr. A. M. Stewart	Belle River	76	28	59	8	66	6
Mr. E. G. Geddings	Abney	74	13	61	26	63	1
Mr. Ottis McLeod	Uigg	61	9	48	26	45	26
Average yield per acre, 1914		70	23	56	20	58	11
Grand average yield per acre, 1912-14, from 26 plots of each variety on eight farms		62	21	52	24	55	12

From the above data we see that Banner has increased its lead over Ligowo to 9 bushels and 31 pounds, and over O. I. Black to 7 bushels and 9 pounds, the season being somewhat against such weak strawed varieties as the Old Island Black.

I wish again to thank the men mentioned above for the very careful and painstaking assistance which they have given in connection with this series of experiments.

CHARLOTTETOWN.

EXPERIMENTAL FARM, NAPPAN, N. S.

W. W. BAIRD, B.S.A., SUPERINTENDENT.

SEASONAL NOTES.

Cerealists cannot be other than pleased with the effect of the 1914-15 season on cereal crops in general. Although the spring growing period was somewhat unfavorable owing to the cold and damp weather, nevertheless the various grains made good growth when they once got started. The summer season was fairly dry and allowed the grain to ripen in good condition and the weather during the harvesting period could not have been more auspicious.

Seeding was done during the few very fine days of the latter part of May. These weather conditions were so favourable at this time that germination took place much more rapidly than last year. The grain was only seven days in showing above the ground, whereas last year it was from eighteen to twenty days. All the grain was some fifteen days later in being sown this year, but was more advanced the first week in June than it was the previous season, due to favourable weather conditions prevailing at that time.

The first part of June was very cold and frequent precipitations were recorded. The weather became more favourable towards the latter part, however. July and August were good growing months with only occasional precipitations and cool weather. September opened with cool, wet weather, but several exceptionally fine days occurred during the middle of the month and presented ideal conditions for harvesting. All grains were stored in excellent condition and very satisfactory yields were recorded.

Up to the 16th of October weather conditions were most favourable for harvesting, but a cold, wet spell was experienced after that date, which caused some delay. Quite heavy frosts were recorded during the early part of the month. Only fair progress could be made in fall ploughing, as much of the land was too wet. The total precipitation was 2·46 inches. Cold, wet weather prevailed throughout the first three weeks in November. The remaining part was very fine and mild, enabling all roots to be harvested in fair condition. The total precipitation was 2·97 inches. The weather was rather unsettled during December. The first two weeks were fairly fine with occasional snow flurries. Fairly heavy showers with low temperatures characterized the latter part. It may be said that it was a very open fall with considerable rainfall, followed by a very open winter with much mild weather during the latter part.

Smut was much in evidence, more especially in the oats. All grain was very free from noxious weeds and very little lodging was noted excepting in Daubeney oats which gave evidence of being weak in the straw.

SOME WEATHER OBSERVATIONS taken at Nappan Experimental Farm, 1914.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	
1914.	°	°	°	Inches.	Inches.	Inches.	Hours.
January	46	−19	13·5	1·30	17·00	3·00	92·40
February	42	−27	7·5	·30	23·00	2·60	138·50
March	46	8	30·17	1·73	4·00	2·13	107·85
April	61	8	33·94	1·89	18·00	3·69	172·05
May	79	24	49·03	·75	....	·75	147·10
June	77	26	54·19	4·23	....	4·23	243·30
July	84	35	61·54	3·61	....	3·61	255·00
August	84	40	62·84	2·95	....	2·95	210·80
September	84	33	56·25	3·05	....	3·05	161·75
October	69	20	27·02	2·46	....	2·46	139·35
November	60	7	33·59	2·97	....	2·97	85·75
December	51	−17	20·22	1·46	....	1·46	110·15
Total for year				26·70	62·00	32·90	1,864·20
Average for five years				30·83	56·74	36·71	2,003·04
Total for six growing months, April to September				16·48	18·00	18·28	1,190·20
Average of five years for 6 growing months, April to Sept.				17·56	6·3	18·19	1,298·65

Uniform test plots of wheat, oats and barley were sown in duplicate on May 21 and 22 on land which was medium heavy clay loam with a sandy subsoil. The preceding crop had been roots, on which manure was applied at the rate of twenty tons per acre. The land was fall ploughed and thoroughly cultivated in the spring to insure as friable a seed bed as possible.

NAPPAN.

EXPERIMENTS WITH SPRING WHEAT.

Eleven varieties of wheat were grown in uniform test plots of one-sixtieth of an acre each.

Seed was sown at the rate of one bushel three pecks per acre. Although sown some fifteen days later than last year, germination took place much more rapidly, due to favourable weather and the good condition of the soil. Particularly favourable weather was experienced during July and August, and harvesting was done in excellent condition.

The following were the average yields obtained. Varieties not yet named are omitted from the table.

WHEAT.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing	Average length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	lb.	Lb.
1	White Russian...	May 21..	Sept. 16	117	53·5	8	3·5	2,700	45	.	59·0
2	White Fife ...	" 21..	" 16	117	58·7	9	3·7	2,655	44	15	59·0
3	Marquis.........	" 21..	" 14..	115	51·0	10	3·0	2,535	42	15	60·0
4	Bishop	" 21	" 12	113	52·0	9	3·0	2,347	39	7	60·0
5	Early Red Fife ..	" 21..	" 14..	115	53·0	10	3·0	2,347	39	7	60·0
6	Huron...... ..	" 21.	" 12.	113	46·0	10	3·0	2,182	36	22	60·2
7	Red Fife	" 21..	" 14	115	49·0	10	3·0	2,130	35	30	59·0
8	Stanley........	" 21..	" 14	115	48·5	10	3·5	1,852	30	52	59·0
9	Pioneer........	" 21..	" 12	113	43·5	6	2·5	1,845	30	45	61·0

The average yield of all the plots of wheat was 37 bushels 48·6 pounds per acre.

EXPERIMENTS WITH BARLEY.

Experiments were conducted with barley in duplicate with twelve varieties, six of six-rowed and six of two-rowed, in test plots one-sixtieth of an acre in size. The grain was sown at the rate of two bushels per acre, and very satisfactory growth was made during the season.

The following were the results obtained:—

BARLEY—Six-Row—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening	Number of days Maturing	Average length of Straw including Head.	Strength of Straw on a scale of 10 points	Average length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	lb.	Lb.
1	Nugent.........	May 22.	Sept. 5..	105	44·5	10	2·5	2,700	56	12	48·2
2	Manchurian	" 22..	" 5..	105	45·0	10	3·0	2,595	54	3	47·7
3	O.A.C. No. 21..	" 22..	" 3..	103	46·7	10	2·7	2,220	46	12	44·0
4	Stella..	" 22	" 7..	107	46·5	5	2·5	2,205	45	45	48·5
5	Odessa.....	" 22	Aug. 31..	100	42·3	10	2·3	1,770	36	42	48·5
6	Oderbruch.......	" 22	" 31..	100	43·3	10	2·3	1,590	33	6	48·2

The average yield of all the plots of six-row barley was 45 bushels 20 pounds per acre.

NAPPAN.

BARLEY—Two-Row—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw including head.	Strength of straw on a scale of 10 points.	Average Length of head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	lb.	Lb.
1	Swedish Chevalier..	May 22	Sept. 5	105	41·3	5	3·3	3,150	65	..	50·0
2	French Chevalier .	" 22	" 3	103	40·3	9	3·3	2,790	58	30	59·5
3	Gold.....	" 22	" 5	105	38·5	8	2·5	2,790	58	6	53·5
4	Canadian Thorpe..	" 22	" 7	107	46·5	9	2·5	2,550	53	6	47·5
5	Invincible..........	" 22	" 7	107	53·0	10	3·0	2,340	48	36	50·0
6	Beaver............	" 22	" 5	105	46·0	9	3·0	1,440	30	..	49·7

The average yield of all the plots of two-row barley was 52 bushels 14 pounds per acre.

OATS.

Twelve varieties of oats were tested in duplicate test plots one-sixtieth of an acre in size, the seed being sown at the rate of three bushels per acre. A very strong stand was obtained in the majority of cases, and the only varieties to be affected with lodging were Daubeney and Lincoln. Smut and rust were considerably in evidence, particularly the former, which no doubt appreciably affected the yield.

The following were the results obtained:—

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Sowing	Date of Ripening.	Number of days maturing.	Average Length of Straw including head.	Strength of Straw on a scale of 10 points.	Average length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	lb.	Lb.
1	Victory....... .. .	May 21	Sept. 12	113	55·0	8	7·0	3,390	99	24	40·0
2	Gold Rain........	" 21	" 8	109	56·5	10	7·5	3,180	93	18	38·0
3	Swedish Select. ...	" 21	" 8	109	55·0	8	7·0	3,135	92	7	37·5
4	Banner............	" 21	" 7	108	55·0	10	7·0	3,090	90	30	38·0
5	Siberian........	" 21	" 10	111	58·0	9	8·0	3,045	89	19	35·0
6	Twentieth Century	" 21	" 10	111	54·0	10	8·0	3,009	88	8	38·0
7	Danish Island.....	" 21	" 10	111	56·0	10	8·0	2,955	86	31	35·0
8	Daubeney..........	" 21	Aug. 27	97	50·5	7	6·5	2,910	85	20	34·0
9	Lincoln..	" 21	Sept. 10	111	56·5	8	7·5	2,885	84	29	37·0
10	Ligowo......	" 21	" 10	111	56·0	9	8·0	2,865	84	9	38·5
11	Pioneer.	" 21	" 5	106	55·5	9	7·5	2,820	82	32	39·0
12	Abundance..... ..	" 21	" 7	108	53·0	8	7·0	2,805	82	17	37·0

The average yield of all the plots of oats was was 88 bushels 14·6 pounds per acre.

NAPPAN.

BUCKWHEAT.

Five varieties of Buckwheat were sown in uniform test plots of one-fortieth of an acre in size, lack of suitable soil preventing this work being duplicated. The soil was a clay loam and had been summer-fallowed the previous season and was only in a fair state of fertility. Barnyard manure was applied at the rate of twenty tons per acre and a thorough cultivation was given. The yield was somewhat reduced owing to the plots being grown between two rows of large apple trees.

The following were the results:—

BUCKWHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw, including head.	Strength of Straw on a scale of 10 points.	Yield of Grain per acre.	Yield of Grain per acre.		Weight per measured bushel after cleaning.
					Inches.		Lb.	Bush.	lb.	Lb.
1	Silverhull	June 12	Sept. 7	87	32	9	1,000	20	40	49·5
2	Grey	" 12	" 7	87	31	10	1,800	37	24	47·0
3	Japanese	" 12	" 7	87	33	10	1,320	27	24	48·0
4	Rye	" 12	" 7	87	34	10	1,840	38	16	50·0
5	Tartarian	" 12	" 7	87	33	10	1,600	33	16	49·0

The average yield of all the plots was 31 bushels 24 pounds per acre.

NOTE.—Silverhull was badly picked by birds, which explains its low yield. Estimated loss, 40 per cent.

PEAS.

Ten varieties of peas were sown in duplicate plots one-sixtieth of an acre in size on May 30. The soil was a medium clay loam, and received the same cultivation and treatment as that for the field lots of grain. Unfortunately these peas were so badly infected with blight that no crops could be harvested.

FIELD CROPS OF SEED GRAIN.

Some twelve acres were sown of wheat, oats and barley in field plots one and two acres in size.

The soil was a clay loam varying from medium to heavy. Three acres of wheat were sown on soil which had produced roots the previous season and had been manured at the rate of twenty tons per acre. It was ploughed in the fall of 1913 and given a thorough cultivation in the spring of 1914 to ensure as perfect a seed bed as possible.

The soil on which the oats were grown had produced a crop of roots in 1911, when it received barnyard manure at the rate of twenty-five tons per acre. In 1912 it produced a crop of grain and in 1913 a crop of clover hay was harvested. The aftermath of this crop was ploughed under and the field produced another crop of grain this year. No fertilizer or manure had been applied to this field since 1911, with the exception of the clover which had been ploughed under.

The barley was sown on land which had produced a crop of roots the previous year and had been manured at the rate of 25 tons per acre. This field was not ploughed in the fall of 1913 on account of being too wet, but was ploughed in the spring of 1914 and received a very thorough cultivation.

Seed produced by these field lots of grain was cleaned and hand-picked during the winter and is now for sale in small quantities.

The following table gives the yields which were realized:—

——	Date of Seeding.	Date of Ripening.	Total Yield.		Yield per acre.	
			Bush.	lb.	Bush.	lb.
Wheat—						
1½ acres Red Fife	May 22	Sept. 21	53	..	35	5
1½ acres Huron	" 22	" 16	41	30	27	40
Oats—						
3 acres Ligowo	May 22	Sept. 10	158	20	52	29
2 acres Abundance	" 23	" 13	137	22	68	28
2 acres Banner	" 23	" 13	142	..	71	00
Barley—						
1 acre Manchurian	June 3	Sept. 17	53	17	53	17
1 acre French Chevalier	" 3	" 17	54	28	54	28

NAPPAN.

EXPERIMENTAL STATION, KENTVILLE. N.S.

W. S. BLAIR, SUPERINTENDENT.

April was cold and backward. The rainfall during May was light. Cool, cloudy days, however, with no warm drying winds during the first half of May kept the land wet, and, except on very dry places, land was not fit to work until the 16th. From this date to the end of the month the weather was fine and dry for seeding. The first seeding was done on the 20th. The temperature during June was slightly below normal. There was a light frost on June 4, which was much more severe at other points in the valley than at this station, however, no injury to grain was reported. Early-seeded barley showed a slight yellowing evidently due to low temperature but it recovered toward the latter part of June. Precipitation was ample, 4·2 inches of rain having fallen during the month. July was also cool being about 1 degree lower than the average mean. The month was exceedingly dry at this station only 1·45 inches of rain having fallen. There was much more rain in other parts of the province, however, during this period. The sunshine was not as great as usual, and this with the relatively cool weather offset the shortage in rain somewhat so that cereal crops made good growth. August was a favourable month with well distributed showers making a total rainfall of 2·58 inches. The mean temperature was about 1 degree below the average. During the first week of September we had frequent heavy showers which made it difficult to properly dry the grain which was cut at this time. After this, however, the harvest weather for late grain was fine.

The season throughout favoured cereal crops. The growth of straw was good and generally was secured in good condition.

LAND FOR GRAIN PLOTS.

The land for cereal work was in forest growth in 1910, the wood being cut in 1911. The ground was cleared of stumps in the fall of 1912 and early spring of 1913. This land could not be got ready early in 1913, and it was thought desirable to seed to oats with the intention of cutting green for feed. The fall of 1913 however was favourable and the growth good, with the result that the grain ripened fairly well. No fertilizer was put on this land in 1913, but this season a fertilizer composed of nitrate of soda, acid phosphate and muriate of potash containing 4 per cent nitrogen, 8 per cent phosphorus and 5 per cent potash was sown broadcast at the rate of 400 pounds per acre before seeding the plots.

GRAIN PLOTS.

A small start was made in 1913 with selected seed supplied by the Cereal Division, Ottawa. This grain was saved and half an acre each of Red Fife and Marquis wheat, Manchurian and Canadian Thorpe barley, and one acre each of Banner and Daubeney oats were seeded in 1914. The land on which this grain was sown was as stated above. The seed was sown on May 20 with a disc drill and the ground seeded to clover and timothy at the same time. The yield per acre and other data secured from these areas are as follows:—

Variety.	When Cut.	Length of Straw.	Yield per Acre.	
		Inches.	Bush.	lb.
Manchurian Barley	Aug. 24	32	24	12
Canadian Thorpe Barley	" 24	34	22	8
Daubeney Oats	" 19	40	52	28
Banner Oats	" 29	46	58	9
Marquis Wheat	" 29	41	26	15
Red Fife Wheat	Sept. 4	42	23	5

WINTER RYE.

A piece of ground was seeded to winter rye September 12, 1913. The land was in grain in 1913 and was cleared from stumps in 1911 and 1912. Ten tons of manure were spread on the land in the fall of 1913, after which it was ploughed, well worked down and seeded. The crop was harvested August 7, and yielded 23 bushels per acre. The growth of straw was 54 inches.

KENTVILLE.

Multiplying plot of Ligowo oats at Charlottetown, P.E.I., 1914.

Cereal plots at Charlottetown, P.E.I., August, 1914.

General view of Experimental Plots, Brandon Experimental Farm.

EXPERIMENTAL STATION, FREDERICTON, N B.

W. W. HUBBARD, SUPERINTENDENT.

From a cereal standpoint the weather for 1914 was in the main fairly good. May was cold and dry, enabling the preparation of a seed bed but germination was slow. June gave sufficient moisture, but no warmth, and grain came up rather yellow and feeble. July was dry but grain did not suffer from drought; there was, however, lack of heat. From August 1, however, weather conditions were ideal and crops came on well and as the good weather continued through September and October harvesting was well done. On the Station land, soil conditions were such as to prevent large yields, but in the Province generally yields of grain were slightly better than for the last five years.

As yet no experimental work with cereals has been undertaken at this Station. The old land on the farm is so full of mustard that no good results can be obtained in grain growing until this troublesome weed has been worked out, and the land that is being cleared and drained is as yet too uneven to permit of work of any record value being done upon it.

Thirty-five acres of newly cleared land were sown in oats from the 23rd to 30th May, the varieties of oats used being Banner, New Market and Early Blossom. The first sowing was of Banner on 4½ acres, seeded at the rate of three bushels per acre. The yield was 220 bushels, at the rate of 48·8 bushels per acre. The next sowing was 4¾ acres of New Market on May 27th. The yield was 200 bushels, at the rate of 42·1 bushels per acre. On the 28th, 29th, and 30th May 25¾ acres of newly stumped land was sown with home grown Banner, P. E. Island Banner, New Market and Early Blossom Oats and the yield was 583 bushels, at the rate of 22·6 bushels per acre.

In the latter case a portion of the crop could not be threshed as the stubble was so full of small roots we could not put the rakings through the thresher. This ground was very rough and uneven, and the crop could not be cut with a binder. A self-rake reaper was used and all that could not be lifted clear with a fork could not be threshed, between two and three bushels per acre was thus probably not accounted for.

Buckwheat was sown upon seven and a half acres of newly cleared land, as soon as the land could be got ready, on 27th June, at the rate of one bushel per acre. Two hundred and twenty pounds of 2-5-8 fertilizer were sown with the seed and there were also some ashes from the stump piles spread over the ground. At no time did this crop do well and the yield was only 136 bushels, at the rate of 18·1 bushels per acre. Three varieties of buckwheat were grown, viz.: Rough or Yellow, Silver Hull and Barley Buckwheat. It was not possible, by reason of the roughness of the land, to keep these varieties sufficiently well separated to give reliable yields of each.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

JOSEPH BEGIN, SUPERINTENDENT.

It has been impossible, thus far, to start a regular series of experimental plots of cereals, but the purchase and preparation of additional land will make it possible to undertake such experiments on a suitable scale in the near future. It is proposed to have a series of test plots of wheat, oats, barley, peas, etc., and also to grow a few of the best varieties in a larger way.

This season seven of the most promising kinds of grain for this district were tested on somewhat irregular pieces of land. The following table gives the results of the tests. All the varieties were sown on June 2, fifteen pounds of seed being used in each case.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Average Length of Head.	Yield of Grain.
			Inches.	Inches.	Lb.
Huron wheat	Sept. 14	104	34	3·0	232
Marquis wheat	" 12	102	33	3·0	201
Ligowo oats	" 10	100	31	6·0	170
Daubeney oats	" 8	98	32	6·0	145
Manchurian barley	Aug. 26	85	28	3·2	269
Success (beardless) barley	" 20	79	25	3·1	248
Arthur peas	Sept. 10	100	24	2·1	276

In order to determine the action and value of Farmogerm (nitrogen gathering bacteria), one-half of the plot of Arthur peas was sown with seed which had been treated with this substance. The other half was sown with untreated seed. Unfortunately no definite conclusions can be drawn from the experiment, as the lower portion of the plot where the treated seed was sown was on a steep slope and was considerably damaged by water. There appeared, however, to be some advantage from the treatment of the seed.

EXPERIMENTAL STATION FOR CENTRAL QUEBEC.

GUS. LANGELIER, SUPERINTENDENT.

WORK WHICH IS OF INTEREST TO GRAIN GROWERS.

Work done at this Station, and which is of interest to grain growers, comprises the test of different varieties of spring wheat, barley, oats, peas, the growing of grain for seed, and the selection of high yielding strains.

THE SEASON AT CAP ROUGE IN 1914.

All the grain was sown in the trial plots by May 19th, so that the spring was an average one as regards earliness. Germination was good, as there was just about enough precipitation from the above date until the end of the month. June was a little too dry, but the rains of the 25th, 29th and 30th came in time to save all vegetation, which would have been parched by the drought which lasted all through July until August 11. The yield, however, was cut down somewhat, but as there was ample precipitation during the latter part of August until harvest, the crop was a fair one.

VARIETY TESTS.

The trial plots of grain are all of 1/60-acre and come in a regular three-year rotation where they are preceded by a hoed crop and followed by hay. They are on a very uniform, though not very fertile, piece of sandy loam, with a subsoil of shale about eighteen inches down. The land had received twenty tons of manure per acre in 1913, and was ploughed in October of the same year; during the spring of 1914, it was double disced twice, harrowed, rolled and sown with the horse drill. The plots were rogued and kept free of weeds. The grain did not lodge and was not hurt by fungous diseases, insects, birds or rodents. It was cut by hand, threshed with a special easily cleaned machine, to avoid mixing varieties, and passed through the fanning mill before being weighed. Everything was grown in triplicate so as to avoid as much as possible errors due to irregularities of soil.

SPRING WHEAT.

Four varieties were tested: Early Red Fife, Huron, Marquis and Red Fife. The seed was sown at the rate of 1½ bushels to the acre. Huron was the highest yielder with 1,640 pounds per acre and took 99 days to come to maturity, whilst Marquis ripened first in 96 days and only gave 480 pounds per acre. The average yield for the four varieties was 902 pounds per acre and the average number of days to come to maturity was 98. The average, since 1911, placed Huron at the head with 1,385 pounds per acre and it was only three days later to ripen than Marquis, which gave an average yield of only 955 pounds. Though Huron is bearded and has not such high milling qualities as the other three varieties tried in 1914, it is, here, a much better yielder and it seems the variety best adapted to this district.

The following tables give details about results of 1914 and also of the last four years:—

SPRING WHEAT 1914.

Number.	Name of Variety.	Date of sowing.	Date of ripening.	No. of days maturing.	Average length of straw including head.	Strength of straw, on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.	
					Inches.		Inches.	Lb.	Bush.	Lb.
1	Huron	May 19.	Aug. 26.	99	31·6	10	3·2	1,640	24	00
2	Early Red Fife....	" 19.	" 26.	99	27·6	10	3·1	1,180	19	40
3	Marquis	" 19.	" 22.	96	16·3	10	1·9	480	8	00
4	Red Fife..........	" 19.	" 25.	98	18·3	10	1·9	310	5	10

SPRING WHEAT 1911-1914.

Number.	Name of Variety.	Number of years under test.	Average number of days maturing.	Average yield of grain per acre.	Average yield of grain per acre.		Remarks.	Years under test.
				Lb.	Bush.	Lb.		
1	Huron..........	4	103	1,385	23	5	....	1911-12-13-14.
2	Preston..........	3	101	1,315	21	55	....	1911-12-13.
3	Bobs..........	3	96	1,245	20	45	Total failure in 1913	1911-12.
4	Bishop.........	3	96	1,215	20	15	" "	1911-12.
5	Marquis........	4	98	955	15	55	" "	1911-12-13-14.
6	197 C..........	2	105	870	14	30	....	1912-13.
7	Yellow Cross....	3	99	825	13	45	....	1911-12-13
8	White Fife......	3	103	772	12	52	Total failure in 1913.	1911-12.
9	Early Red Fife..	4	103	756	12	36	....	1911-12-13-14.
10	Red Fife........	4	101	673	11	13	Total failure in 1913.	1911-12-13-14.
11	Pioneer (195 F)..	2	105	390	6	30	" "	1912-13.
12	86 D 2..........	2	109	330	5	30	" "	1912-13.

OATS.

Six varieties were tested: Banner, Daubeney, Eighty Day, Gold Rain, Swedish Ligowo and Victory. The seed was sown at the rate of 2½ bushels to the acre. Gold Rain was at the head with 2,200 pounds per acre and ripened in 85 days, whilst Eighty Day was first ready to cut, 78 days after it was sown, and yielded 1,600 pounds per acre. The average yield for the six varieties was 1,830 pounds per acre and the average number of days to come to maturity was 87. The average, since 1911, places Banner at the head with 2,373 pounds per acre, but it is ten days later than Eighty Day which gave 1,847 pounds. It is clear that where the season is long enough, Banner should be strongly recommended, whilst for the districts where an early frost is to be feared, Eighty Day should be sown.

CAP ROUGE.

In the following tables will be found details about varieties tried at this Station since 1911:—

OATS 1914.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 Points.	Average Length of Head.	Yield of Grain per acre.	Yield of Grain per acre.
					Inches		Inches.	Lb.	Bush. Lb.
1	Gold Rain	May 19	Aug. 12	85	33·0	10	6·1	2,200	64 26
2	Daubeney Selected.........	" 19	" 9	82	33·3	10	5·5	2,000	58 28
3	Banner..............	" 19	" 22	94	33·5	10	6·8	1,960	57 22
4	Ligowo Swedish...........	" 19	" 18	91	33·0	10	6·0	1,640	48 8
5	Eighty Day	" 19	" 5	78	27·5	10	4·5	1,600	47 2
6	Victory........	" 19	" 16	89	31·3	10	5·6	1,580	46 16

OATS 1911-1914.

Number	Name of Variety	Number of Years under test.	Average number of days Maturing.	Average Yield of Grain per acre	Average Yield of Grain per acre.	Remarks.	Years under test.
				Lb	Bush. Lb.		
1	Banner	4	98·0	2,373	69 27	Did not ripen in 1912	1911-12-13-14
2	Gold Rain..	4	101·0	2,312	68 ..	.....	1911-12-13-14
3	Victory	4	96·0	2,267	66 23	Did not ripen in 1912	1911-12-13-14
4	Daubeney Selected........	4	91·2	2,030	58 8	....	1911-12-13-14
5	Siberian	3	109·3	1,980	58 8	....	1911-12-13
6	Ligowo Swedish...........	4	105·0	1,891	55 21	....	1911-12-13-14
7	Twentieth Century..	3	106·3	1,890	55 20	....	1911-12-13
8	Eighty Day	4	88·0	1,847	54 11	....	1911-12-13-14
9	Abundance (Garton's).....	3	106·0	1,765	51 31	....	1911-12-13
10	Thousand Dollar	3	106·3	1,550	45 20	....	1911-12-13

SIX-ROW BARLEY.

Barley was always a poor crop at this Station until this year when an application of lime more than doubled the yield. Only three varieties were tested: Manchurian, O. A. C. No. 21 and Success. The seed was sown at the rate of 2 bushels to the acre. Success was the highest yielder with 680 pounds per acre and was first ready to cut 77 days after it was sown. The average yield, for the three varieties, was 643 pounds per acre and the average number of days to come to maturity was 81. Manchurian generally does so well everywhere that we recommend it until Success has shown a decided superiority over it.

Some data will be found in the two following tables about six-row barley grown at this Station since 1911:—

Barley (Six-Row) 1914.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing	Average length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.
					Inches.		Inches.	Lb.	Bush. lb.
1	Success	May 19	Aug. 2	75	20·0	10	2·7	680	14 8
2	Manchurian	" 19	" 12	85	20·7	10	2·3.	660	13 36
3	O.A.C. No. 21	" 19	" 10	83	22·3	10	2·5	590	12 14

Barley (Six-Row) 1911-1914.

Number.	Name of Variety.	Number of years under Test.	Average Number of days Maturing.	Average Yield of Grain per Acre.	Average Yield of Grain per Acre		Remarks.	Years under Test.
				Lb.	Bush	Lb.		
1	Odessa	3	88	1,305	27	9	Total failure in 1913.	1911-12-13.
2	Success	4	78	1,022	21	14	" "	1911-12-13-14.
3	Escourgeon	3	95	1,020	21	12	....	1911-12-13.
4	Manchurian	4	88	990	20	30	Total failure in 1913.	1911-12-13-14.
5	Black Japan	3	88	795	16	27	" "	1911-12-13.
6	O.A.C. No. 21.	4	87	717	14	45	" "	1911-12-13-14.
7	Stella	3	88	592	12	16	" "	1911-12-13.

FIELD PEAS.

Four varieties were tested: Arthur Selected, English Grey, Golden Vine, and Prussian Blue. The plots were sown on May 19. Arthur Selected came on top with 1,200 pounds per acre and took 91 days to come to maturity, whilst Golden Vine was first ready to cut, 89 days after it was sown, and yielded 1,180 pounds per acre. The average yield, for the four varieties, was 1,172 pounds and the average number of days to come to maturity was 93. The average, since 1911, places Arthur Selected at the head with 2,100 pounds per acre and it was about a day later than Golden Vine which only gave 1,778 pounds. Arthur Selected shows decided superiority over the other varieties tried at this Station and it is strongly recommended to farmers.

Cap Rouge.

Details will be found in the two following tables about peas sown here since 1911:—

PEAS 1914.

Number.	Name of Variety.	Quantity of seed per Acre.	Date of Ripening.	Number of days Maturing.	Average length of vine including Head.	Average length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.	
		Bush.			Inches.	Inches.	Lb.	Bush.	lb.
1	Arthur Selected	2¾	Aug. 18	91	28·0	2·5	1,200	20	00
2	Golden Vine	2½	" 16	89	24·3	1·8	1,180	19	40
3	Prussian Blue	2¼	" 25	98	28·0	2·3	1,160	19	20
4	English Grey	2¾	" 23	95	30 3	2·5	1,150	19	10

PEAS 1911-1914.

Number.	Name of Variety.	Number of years under test.	Average number of Days maturing.	Average yield of Grain per Acre.	Average yield of Grain per Acre.		Remarks.	Years under test.
				Lb.	Bush.	Lb.		
1	Arthur Selected	4	101	2,100	35	00	Eaten by aphis in 1912.	1911-12-13-14.
2	English Grey	4	103	1,913	31	53	" "	1911-12-13-14
3	White Marrowfat	3	101	1,875	31	15	" "	1911-12-13.
4	Wisconsin Blue	3	101	1,785	29	45	" "	1911-12-13.
5	Golden Vine	4	101	1,778	29	38	" "	1911-12-13-14.
6	Mackay	2	82	1,755	29	15	" "	1911-12.
7	Black-eye Marrowfat	2	82	1,665	27	45	" "	1911-12.
8	Chancellor	2	82	1,560	26	00	" "	1911-12.
9	Prussian Blue	4	104	1,481	24	41	" "	1911-12-13-14.
10	Paragon	2	82	1,020	17	00	" "	1911-12.

NUTRIENTS IN DIFFERENT KINDS OF CEREALS.

The following table takes in every plot used for variety tests since 1911, inclusively, and will no doubt be of interest to live stock men:—

DIGESTIBLE nutrients furnished by different grains per acre.

Kind of Grain.	Number of Plots.	Grain per Acre.	Dry matter per Acre.	Digestible nutrients per acre.		
				Protein.	Carbohydrate.	Fat.
		Lb.	Lb.	Lb.	Lb.	Lb.
Barley (six row)	24	990	883·1	83·2	646·5	15·8
Oats	46	2,011	1801·8	215·2	1011·5	76·4
Peas	28	1,757	1493·4	346 1	866·2	7·0
Wheat	43	932	834 1	82·0	629·1	13·9

CAP ROUGE.

GRAIN GROWN FOR SEED.

Huron wheat, Banner oats, Manchurian barley, and Arthur Selected peas are the varieties which can be recommended to farmers of this district, and a few acres of each are grown every year for seed. In 1914, the following yields were obtained:—

Huron wheat..	1,805	pounds	or	30	bushels	and	5	pounds	per	acre.
Banner oats..	2,150	"	"	63	"	"	8	"	"	"
Manchurian barley	1,015	"	"	21	"	"	7	"	"	"
Arthur Selected peas	1,507	"	"	25	"	"	17	"	"	"

Some of the above was sent to Ottawa to be distributed to farmers, whilst the rest was for sale at the following prices, which are generally the same each year: oats, $1 per bushel of 34 pounds; barley, $1.50 per bushel of 48 pounds; wheat, $1.75 per bushel of 60 pounds; peas, $2.50 per bushel of 60 pounds.

SELECTION OF HIGH YIELDING STRAINS.

Farmers are getting interested in the work of selecting grain in their fields so as to be able to improve the yield at first and then maintain it at a high standard. We do some work at this Station, in this line, so as to be able to show how simple it is, for many are kept from it by the thought that it is very complicated. To start with, we pass through a field of wheat, oats, barley or peas, and pick about five hundred of the best and most productive looking plants which we can find. Of course, in doing this, we leave aside all plants which are diseased, which have weak straw, which are not of the right type, or which in some way are of inferior quality. During winter we take the grain from each of these five hundred plants, we weigh each lot separately and keep the hundred heaviest lots, which are planted the next spring in as many different rows. This is the well known head-row method of selection. In the fall, we keep separate the product of every row until each lot of grain can be weighed, when we keep the ten best plants from the lots which were the highest yielders. Grain from these ten best plants is again sown in different rows and we keep the product of the highest yielding row for a multiplication plot where it is all sown. The following year there is probably enough grain to grow what will be required for seed in all fields another season. From one of these fields the five hundred heads are chosen and the same thing worked around all over again.

There are several other methods which can be used, but this is rather simple and farmers seem disposed to adopt it. No new types are likely to be found in this way (unless the grain with which we start is unselected) but the varieties will be kept in a very high state of purity; and the results are likely to be much more satisfactory than those obtained by the old method of attempting to maintain productiveness by an occasional change of seed.

Work of this kind has been started with Huron wheat, Banner oats, Manchurian barley, and Arthur Selected peas.

EXPERIMENTAL FARM, BRANDON, MAN.

W. C. McKILLICAN, B.S.A., SUPERINTENDENT.

THE SEASON.

The season of 1914 was unfavourable for cereal crops. The spring, though somewhat backward, was the best part of the season, and up till July 1, crops did well. July and August were extremely hot and dry, and all grain crops were forced into too rapid maturity. As a result yields were distinctly below average.

TEST OF VARIETIES.

The usual tests of varieties of cereals were conducted again in 1914. The system of using duplicate plots for each variety is being continued, and is much more satisfactory than single plots, where any peculiarity of one plot or any accident may destroy the season's results in regard to a variety.

The land used for all cereal plots is a sandy loam. It was summer fallowed in 1913.

SPRING WHEAT.

Four named varieties of spring wheat were tested this year. In addition eleven of the new cross-bred varieties originated by the Dominion Cerealist were tried out under number. No public report is made of these until the best are selected and introduced as desirable varieties. However, it is not expected that any of these will be of value in this section of Manitoba.

The wheat plots were sown on May 1 at the rate of 1¾ bushels of seed per acre. The results are shown in tabular form as follows:—

Spring Wheat—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	Number of Days maturing.	Average length of Straw including Head.	Strength of Straw on a scale of 10 Points.	Average length of Head.	Rust.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.		Bush.	Lb.	Lb.
1	Marquis........	Aug. 5	96	38	10	2·7	Almost none	36	30	63·0
2	Pioneer.........	" 4.	95	40	8	3·0	Rather bad.	32	35	59·0
3	Prelude........	July 29	89	37	8	2·0	None.....	31	30	63·2
4	Red Fife.......	Aug. 11.	102	43	10	3·0	Medium....	22	35	57·0

Marquis, as usual, makes the best showing. Its lead over Red Fife is much greater than under normal conditions as the season was especially hard on the later varieties. Marquis was well filled and Prelude almost ripe when the hot winds came; Red Fife at this time was at the most susceptible stage.

Pioneer is a new variety introduced by the Dominion Cerealist for dry districts where Marquis ripens too late and where Prelude grows too short in the straw. Pioneer is not intended for and is not recommended for Manitoba.

FIVE-YEAR AVERAGES.

The following are the average results obtained with Marquis and Red Fife for five years, and with the other two varieties for the period they have been under test, viz., four years:—

Variety.	Average Strength of Straw.	Average Number of Days Maturing.	Average Yield per Acre.	
			Bush.	lb.
Marquis	Stiff	105·0	42	36
Red Fife	Stiff	111·4	37	23
Pioneer (Average of 4 years)	Rather weak	102·3	34	54
Prelude (Average of 4 years)	Rather weak	93·2	25	24

OATS.

Fifteen varieties of oats were tested this year. They were sown at the rate of 2½ bushels per acre on May 9. The following results were obtained:—

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.		Date of Ripening		Number of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of Grain per acre.		Weight per measured bushel after cleaning.
							Inches.		Inches.	Bush.	Lb.	Lb.
1	Daubeney Selected	May	9	July	30	82	38	10	7	89	19	37·5
2	Orloff Yellow	"	9	"	30	82	38	10	7	88	33	34·5
3	Eighty Day	"	9	"	29	81	37	10	7	80	15	35·5
4	Victory	"	9	Aug.	10	93	43	10	7	77	7	37·0
5	Gold Rain Yellow	"	9	"	6	89	43	10	8	75	..	39·7
6	Banner	"	9	"	9	92	41	10	8	74	24	32·5
7	Green Russian	"	9	"	5	88	39	10	7	72	32	34·2
8	Swedish Select	"	9	"	9	92	45	9	8	72	27	37·2
9	O.A.C. No. 72	"	9	"	11	94	48	10	9	71	31	34·0
10	Garton's No. 22	"	9	"	10	93	41	10	7	71	1	37·7
11	Siberian	"	9	"	9	92	45	9	8	70	25	34·0
12	Abundance, Regenerated	"	9	"	7	90	42	10	7	70	20	39·7
13	Ligowo	"	9	"	8	91	44	10	7	70	5	39·0
14	Newmarket	"	9	"	8	91	46	9	8	69	14	38·5
15	Twentieth Century	"	9	"	8	91	42	9	7	68	18	38·0

As in the case of the wheat, so also in the oats, the early varieties have had a great advantage in the seasonal conditions. They were fairly well filled when the terrific heat of the last of July made its blighting influence felt. As a result the early varieties, Daubeney and Orloff, are the heaviest yielders this year instead of being nearly the smallest as is usually the case.

BRANDON.

Eighty Day is a new selection made by Dr. Saunders of the old variety named Sixty Day, but which never ripened in sixty days in this climate. Eighty Day appears to be equally as early as Daubeney and Orloff but has not yielded so well this year. Green Russian is a variety which is in local favour in the Morden and Darlingford districts. It is tried here this year for the first time.

Of the varieties grown in recent years the following were discarded this year: Improved American and Irish Victor because they were believed to be identical with Banner, Thousand Dollar because it has not shown any outstanding merit as compared to the best varieties still under test, and Victor (black) because of the low yield and undesirable colour.

FIVE-YEAR AVERAGES.

Twelve of these varieties have been grown for five or more years, and two others for three years. The following are the average results obtained in that time:—

Variety.	Average Strength of Straw.	Average Number of Days Maturing.	Average Yield per acre.	
			Bush.	Lb.
Banner	Fairly strong	100·8	95	33
Twentieth Century	Medium	101·6	93	16
Gold Rain	Fairly strong	99·4	92	5
Swedish Select	Medium	100·8	90	6
Victory	Fairly strong	101·0	90	4
Siberian	Fairly strong	100·8	89	29
Ligowo	Medium	100·8	87	16
Daubeney	Strong	91·6	85	28
Orloff	Strong	90·4	84	22
Regenerated Abundance	Fairly strong	100·6	81	25
Newmarket (average of 3 years)	Fairly strong	104·3	93	30
Garton's No. 22 (average of 3 years)	Fairly strong	104·3	80	25

From these averages it will be observed that the old reliable Banner variety still holds its place at the head of the list. While some other sort surpasses it each year, in any average of a number of years its merit shows up. None of the newer kinds surpass it as a reliable variety for all purposes.

BRANDON.

BARLEY.

Eight varieties of six-rowed barley and five varieties of two-rowed were tested this year. In addition to the regular test, five new sorts originated by the Dominion Cerealist were tried out for the first time but are not reported.

The barley was sown on May 11 at the rate of two bushels per acre. The hot weather injured barley more than any other grain crop and as a result all yields were lower than usual. The following are the results with six-row barley:—

SIX-ROW BARLEY.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average length of Straw including Head.	Strength of Straw on a scale of 10 Points.	Average length of Head.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Bu.	lb.	Lb.
1	Manchurian	May 11	July 28	78	35	9	2·7	56	37	49·2
2	Garton's No. 68.	" 11	" 27	77	35	9	2·5	55	20	49·7
3	Mensury	" 11	" 28	78	33	9	2·2	54	8	49·5
4	O.A.C. No. 21	" 11	" 27	77	36	10	2·7	51	32	50·0
5	Guymalaye (hulless)	" 11	" 29	79	26	9	2·5	48	6	62·5
6	Mansfield	" 11	" 29	79	31	8	2·0	46	42	50·2
7	Odessa	" 11	" 29	79	32	8	2·2	46	32	48·2
8	Success (beardless)	" 11	" 26	76	36	10	2·2	41	7	49·2

Manchurian, which is first this year, is an improved strain of Mensury and is a highly desirable sort. Garton's No. 68, which stands second, has given consistently good returns ever since it was first tried here three years ago. O. A. C. No. 21, usually a good yielder, with the best straw of any, seemed to be more seriously injured by the heat. An old variety, Yale, grown here for many years has been discarded this year on account of rather low yield and weak straw.

FIVE-YEAR AVERAGES.

Four of the varieties have been grown here for five or more years, one for four years and three for three years. The following are the average returns for these periods:—

Variety.	Average Strength of Straw	Average Number of Days Maturing.	Average Yield per Acre.	
			Bush.	Lb.
Mensury	Fairly strong	85·8	6	29
O.A.C. No. 21	Strong	84·6	67	5
Odessa	Fairly strong	87·4	65	19
Mansfield	"	86·4	50	2
Manchurian (average of 4 years)	"	88·0	75	8
Garton's No. 68 (average of 3 years)	"	88·0	71	46
Guymalaye (average of 3 years)	Strong	86·0	53	16
Success (average of 3 years)	"	82·2	54	12

The following are the results for 1914 with two-row barley:—

Two-Row Barley.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average length of Straw including Head.	Strength of Straw on scale of 10 Points.	Average length of Head.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Bu.	lb.	Lb.
1	Gold	May 11	Aug. 5	86	25	8	3·5	55	10	51·7
2	Swedish Chevalier	" 11	" 3	84	35	5	4·0	43	31	47·7
3	Canadian Thorpe	" 11	" 5	86	33	6	3·0	43	21	50·5
4	Brewer	" 11	" 8	89	35	5	3·5	34	13	46·5
5	Beaver	" 11	" 3	84	38	9	6·0	31	7	49·5

Gold is a comparatively new variety introduced from Sweden. It takes the place of Hannchen and is an improved strain of the same stock. It has outyielded all two-rowed varieties each of the three years it has been tried, but is rather weak in the straw. Two-rowed varieties as a class are not as well suited to western conditions as are the six-rowed varieties.

FIVE-YEAR AVERAGES.

The following are the average results for five years of the varieties that have been tried for that length of time, and for three years for the other two:—

Variety.	Average Strength of Straw.	Average Number of Days Maturing.	Average Yield per Acre.	
			Bush.	lb.
Canadian Thorpe	Medium	90·0	59	4
Swedish Chevalier	Very weak	92·8	58	28
Beaver	Fairly strong	85·4	43	16
Gold (average of 3 years)	Medium	95·0	63	34
Brewer (average of 3 years)	Weak	97·4	58	1

Brandon.

FIELD PEAS.

Nine varieties of field peas were tested this year. They were sown on May 4; the quantity of seed used varied from one and three quarters to two and a half bushels per acre, according to the size of the peas. The following are the results obtained:—

FIELD PEAS. Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
						Inches.	Inches.	Bush.	Lb.	Lb.
1	Paragon	Medium	May 4	Aug. 11	98	45	2·2	36	5	64·0
2	Prince	"	" 4	" 10	97	47	2·0	31	50	64·0
3	Golden Vine	Small	" 4	" 10	97	47	2·0	31	5	63·7
4	Mackay	Medium	" 4	" 11	98	45	2·2	30	50	64·5
5	Prussian Blue	"	" 4	" 10	97	50	2·2	29	10	64·0
6	Arthur	Large	" 4	" 7	94	28	2·5	28	40	65·0
7	English Grey	Medium	" 4	" 12	99	45	2·5	28	10	62·0
8	Chancellor	Small	" 4	" 9	96	40	2·2	26	45	61·0
9	Solo	Medium	" 4	" 9	96	42	2·5	24	30	63·0

FIVE-YEAR AVERAGES.

Eight of these varieties have been grown for over five years and the other one for four years. The following are the average results obtained:—

Variety.	Average Number of Days Maturing.	Average Yield per Acre.	
		Bush.	Lb.
Mackay	118·4	40	30
Prince	118·8	40	19
Paragon	119·0	40	2
Arthur	111·5	37	19
Prussian Blue	117·2	36	38
English Grey	120·0	36	14
Chancellor	117·0	33	30
Golden Vine	120·8	32	44
Solo (average of 4 years)	114·6	42	13

Mackay is recommended as a heavy yielder, but in most districts Arthur is preferable on account of its earliness.

BRANDON.

FLAX.

Seven varieties of flax were tested. They were sown on May 16 at the rate of half a bushel per acre. The results for this year are as follows:—

FLAX.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing	Average Length of Plants.	Yield of Seed per acre.		Weight per measured bushel after cleaning.
					Inches.	Bush.	Lb.	Lb.
1	N.D.R. 73....	May 16....	August 5..	81	24	17	43	55·7
2	Primost.............. ...	" 16 ..	" 8..	84	25	17	18	55·5
3	N.D.R. 52	" 16....	" 6..	82	24	16	34	56·0
4	N.D.R. 114....	" 16 ...	" 6..	82	24·	15	25	56·0
5	La Plata	" 16....	" 18..	94	17	13	32	54·5
6	Golden	" 16....	" 20.	96	18	12	38	55·0
7	Common..................	" 16 .	" 8.	84	27	12	18	55 7

The numbered varieties from North Dakota are the most desirable both in earliness and yield. Golden is a variety that has received a good deal of notice throughout the West in recent years. This is the first time that it has been tried here. The results are not at all in its favour. It is late, short and light yielding.

TWO-YEAR AVERAGES.

Six of these varieties were grown in 1912 and in 1914. The average results of these two seasons are as follows:—

Variety.	Average Number of Days Maturing.	Average Yield per Acre.	
		Bush.	lb.
N.D.R. 52	96·0	20	5
N.D.R. 114........................	95·0	19	49
N.D.R. 73....	97·0	18	25
Primost	99·5	17	53
La Plata	105·5	15	40
Common	96·5	14	21

BRANDON.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

T. J. HARRISON, B.S.A., SUPERINTENDENT.

SEASON.

The season of 1914 was on the whole unfavourable for the production of good cereal crops in southern Saskatchewan. The moisture in the soil from the previous fall and early spring rains caused a good germination of wheat sown on summer fallow. The dry weather which prevailed after the 9th of May, prevented an even germination of the late sown wheat, oats and barley. This also caused a very short growth of straw in all crops. The yield of wheat on the summer-fallowed land would have been fair had it not become frozen on August 9. Because of the dry weather and this frost, harvesting started one month earlier than the year previous and the grain was harvested and threshed without receiving any damaging rains.

SPRING WHEAT.

The variety test of spring wheat was conducted on one-fortieth acre plots. The plots were located on a uniform soil which was summer fallowed the previous year. Only four named varieties were tested, although quite a large number of crossbred sorts supplied by Dr. Saunders were planted. Only the named sorts will be reported. Marquis again demonstrated its ability to mature earlier than Red Fife and yield higher. The Prelude was the earliest sort grown. The Red Fife would have given a higher yield had it not been badly frozen. The plots were sown on April 15 and 16. A system of check plots was employed this season, and the results here published are the corrected, not the actual yields.

SPRING WHEAT—Test of Varieties (corrected figures).

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Marquis........	Aug. 10....	115	42	9·6	3·3	3,194	53	14	63·2
2	Red Fife	" 15....	120	43	5·0	3·5	2,943	49	3	59·1
3	Pioneer........	" 6....	112	40	6·0	3·2	2,761	46	1	63·5
4	Prelude	July 23....	98	36	10·0	2·0	1,873	31	13	63·0

WHEAT IN FIELD LOTS.

This test was made with the four named varieties. The Marquis wheat is the product of special registered Marquis supplied by Dr. Saunders in 1912, the Red Fife was grown from special registered seed supplied in the spring of 1914.

Wheat.—Field Lots.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.	
					Inches.		Inches.	Lb.	Bush.	Lb.
1	Marquis (Fallow)...	April 15..	Aug. 4..	111	41	10	3 0	2,730	45	30
2	Red Fife (Fallow) ..	" 17..	" 18..	123	44	3	3 0	2,452	40	52
3	Marquis (Stubble)..	May 2..	" 15..	105	41	3	3 0	2,309	38	29
4	Marquis (Fallow)...	April 16..	" 10..	116	40	10	3.2	2,214	36	54
5	Marquis (Fallow)...	" 22..	" 10..	110	44	9	3 2	2,070	34	30
6	Pioneer (Fallow)..	" 22..	" 10..	110	42	4	3 2	1,710	28	38
7	Marquis (Fallow)...	" 20..	" 10..	112	40	10	3·0	1,647	27	27
8	Marquis (Corn Stubble)	" 21..	" 2..	103	39	10	3.2	1,583	26	23
9	Marquis (Stubble)..	" 27..	" 10..	105	36	10	3 0	1,554	25	54
10	Marquis (Fallow)...	" 15.	" 10..	117	40	10	3 0	1,430	23	50
11	Marquis (Stubble)..	" 25..	" 9..	106	40	10	3 0	989	16	29
12	Prelude (Fallow) ...	" 20..	July 25..	96	37	10	2 0	986	16	26

SPRING WHEAT—FIVE YEARS' COMPARISON OF FIELD LOTS.

The average yield per acre and the time taken to mature Red Fife and Marquis wheat, grown in field lots, under similar conditions for the past five years, are given below. Prelude has only been grown in field lots for three years and the average is given for that time.

Variety.	Average days to Mature.	Days earlier than Red Fife.	Average Yield	
			Bush.	Lb.
Red Fife..	131·8	....	43	5
Marquis..	123·6	8·2	48	6
Prelude..	102·6	29·2	28	2

OATS.

Sixteen varieties of oats were sown in the spring on the regular one-fortieth acre plots. The seeding was done at the rate of two bushels per acre; the land was summer fallowed the previous year and, due to the very dry season, none of the oats lodged. The frost of August 9 came before many of them were ripe, the result being that a large number took the same number of days to mature. The plots were sown on May 12.

OATS.—Test of Varieties (corrected figures).

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 Points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
				Inc.		Inc.	Lb.	Bush.	Lb.	Lb.
1	Victory.	August 9..	89	41	9	7·0	3,578	105	8	40·0
2	Gold Rain..................	" 9...	89	42	9	6·0	3,493	102	25	40·0
3	Banner......	" 9..	89	42	10	8·0	3,450	101	16	37·2
4	Swedish Select.............	" 9...	89	42	9	6·5	3,408	100	8	38·0
5	Danish Island.............	" 9 ..	89	42	10	8·0	3,238	95	8	38·0
6	Twentieth Century..........	" 9...	89	41	6	7·0	3,196	94	..	38·0
7	Ligowo.	" 9...	89	43	9	7·5	3,025	88	33	38·0
8	O.A.C. No. 72	" 9...	89	45	10	9·0	2,978	87	20	35·0
9	French Lizo.	" 9...	89	43	9	7·5	2,978	87	20	37·0
10	Eighty Day	July 25. .	70	35	9	5·0	2,940	86	16	33·0
11	Daubeney.................	August 4...	84	38	9	7·0	2,391	70	11	36·0
12	Abundance.....	" 9. .	89	40	8	6·5	2,045	60	5	38·0

FIELD TEST OF OATS.

There were three varieties of oats sown in the field. The yield from the Victory would have been considerably higher had not a large portion of the field been damaged by the cut worms.

OATS.—FIELD LOTS.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.	
					Inches.		Inches.	Lb.	Bush.	Lb.
1	Victory (Fallow).........	May 15	Aug. 17	94	45	9	8·5	2,740	80	20
2	Ligowo (Fallow)..	" 18	" 13	87	46	10	8·0	2,568	75	18
3	Banner (Fallow)..	" 18	" 17	91	42	10	8·5	2,464	72	16
4	Banner (Stubble).	" 20	" 15	87	40	10	8·0	2,203	64	27
5	Banner (Stubble).........	" 2	" 10	100	34	10	7·0	1,980	58	8
6	Banner (Stubble).	" 15	" 14	91	34	10	8·0	1,497	44	1

BARLEY.

In the uniform plots of six-row barley seven named varieties and six of Dr. Saunders' numbered cross-breds were tested. The plots were one-fortieth acre in size. The land had been summer-fallowed the year previous. Some of the cross-bred sorts which were hulless failed to germinate. As the seed all tested comparatively high in the germinator and all grain received exactly the same treatment, it is believed that the formaline which was used on the barley was too strong for the hulless sorts. This was a solution of one pound of forty per cent formaline to thirty-five gallons of water. The results of the named varieties are given in the table.

In the variety tests of two-row barley there were seven sorts. They were treated and sown in a similar way to the six-row sorts.

The barley plots were sown on the 11th and 12th of May. Both types are reported on together in the following table:—

BARLEY.—Test of Varieties (corrected figures).

Number.	Name of Variety.	Type.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Strength of Straw on a scale of 10 Points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush	Lb.	Lb.
1	O.A.C. No. 21.	6 row.	Aug. 9	87	37	5	3·0	3189	66	21	48·0
2	Danish Chevalier	2 "	" 7	87	44	9	4·0	3039	63	15	49·0
3	Oderbruch	6 "	" 5	83	33	3	2·5	2875	59	43	49·0
4	Swedish Chevalier...	2 "	" 11	91	38	9	4·0	2775	57	39	46·0
5	Stella......... ..	6 "	" 9	87	38	5	2·5	2740	57	4	45·0
6	Gold..............	2 "	" 7	88	32	8	3·2	2603	54	11	49·0
7	Canadian Thorpe	2 "	" 7	88	35	10	3·5	2524	52	28	49·0
8	Invincible...........	2 "	" 11	91	41	10	3·0	2510	52	14	46·0
9	Standwell..........	2 "	" 11	92	31	7	3·0	2248	46	40	57·0
10	Manchurian.........	6 "	" 7	87	38	7·2	3·5	2247	46	39	45·3
11	Early Chevalier.....	2 "	" 2	82	44	7	3·5	2202	45	42	49·0
12	Mansfield....... ..	6 "	" 10	91	32	4	3·0	1884	39	12	44·0
13	Success (beardless)....	6 "	July 29	79	32	10	3·0	1087	22	31	43·0

BARLEY—FIELD LOTS.

Field tests were made of three varieties—Manchurian, O. A. C. No. 21 and Canadian Thorpe. The O. A. C. No. 21 is a very promising barley and does not seem to have the tendency to shell with the wind storms as badly as the Manchurian.

BARLEY—Field Lots.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.	
					Inches.		Inches.	Lb.	Bus.	Lb.
1	O. A. C. No. 21 (Fallow)...	May 15	Aug. 7	84	40	5	3·2	2,705	56	17
2	Manchurian (Fallow).....	" 9	" 1	84	40	6	3·0	2,640	55	00
3	Canadian Thorpe (Fallow)....	" 15	" 13	90	36	5	3·0	2,584	53	40
4	Manchurian (Corn Stubble)..,	" 12	" 3	83	37	6	3·0	2,186	51	38
5	Manchurian (Fallow).........	" 14	" 9	87	38	6	3·0	2,352	49	00

FIELD PEAS.

Ten varieties of peas were tested out in 1914. The Arthur seems to be best adapted to conditions in this district as it matures earlier than the other varieties and gives a fair yield.

PEAS—Test of Varieties (corrected figures).

Number.	Name of Variety.	Size of Pea.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain.	Yield of Grain per Acre.		Weight per Measured Bushel after cleaning.
						Inches.	Inches.	Lb.	Bush	Lb	Lb.
1	Prince	Large ..	May 1	Aug. 8	100	38	2·5	2,723	45	23	61
2	Paragon	Medium	" 1	" 9	101	41	2·2	2,634	43	54	61
3	Mackay.........	"	" 1	" 11	100	39	2·2	2,294	38	14	62
4	Chancellor	Small ..	" 1	" 8	101	40	2·0	2,226	37	6	63
5	Arthur Selected......	Large...	" 1	" 5	97	43	2·5	2,187	36	27	63
6	Prussian Blue.......	Medium	" 1	" 9	98	39	2·2	2,043	34	3	62
7	English Gray.......	"	" 1	" 9	98	43	2·2	1,971	32	51	59
8	Golden Vine	Small ..	April 28	" 3	99	37	2·0	1,700	28	20	64
9	Solo.....	Large ..	May 1	" 6	99	40	2·5	1,619	26	59	61

PEAS—FIELD LOTS.

Only one small field of peas was sown this season. As the Arthur has always proven the earliest only this sort was used, with the following results:—

PEAS.—Field Lots.

Number.	Name of Variety.	Size of Pea.	Date of Sowing	Date of Ripening.	Number of days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of grain per Acre.	Yield of grain per Acre.	
						In.	In.	Lb.	Bush.	Lb.
1	Arthur (Fallow).....	Large ..	April 22..	August 7 .	107	35	2·2	1,315	21	55

FLAX.

Ten varieties of flax were sown in the regular one-fortieth acre plots. Of the two varieties, Novelty and Longstem introduced by Dr. Saunders, the Novelty seems to be the more promising. The growth of La Plata and Golden was very short and the crop had to be harvested with a mower. As a considerable amount of the seed was lost it was not deemed advisable to report on the yields.

FLAX—Test of Varieties (corrected figures).

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Plants.	Yield of Seed per Acre.	Yield of Seed per Acre.		Weight per Measured Bushel after Cleaning.
					Inches.	Lb.	Bush.	Lb.	Lb.
1	Novarossick	May 21..	Aug. 26..	97	21	786	14	2	53
2	Novelty............	" 21..	" 26..	97	20	708	12	36	53
3	Premost	" 21..	" 25..	96	19	590	10	30	56
4	N.D.R. No. 52.....	" 21..	" 28..	99	19	590	10	30	56
5	N.D.R. No. 73	" 21..	" 25..	96	19	491	8	43	56
6	White Flowering...	" 21..	" 25..	96	19	454	8	6	56
7	N.D.R. No. 114....	" 21..	" 28..	99	16	426	7	34	56
8	Russian	" 21..	" 28..	99	24	363	6	27	55
9	Longstem.........	" 21..	" 29..	100	29	354	6	18	54
10	La Plata.........	" 21..	" 31..	102	15	....	.....	.....	....
11	Golden...........	" 21..	" 31..	102	15	....	.....	.....	....

FLAX—FIELD LOTS.

Three varieties of flax were sown in field lots with the following results:—

Number	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Plants.	Yield of Seed per Acre.	Yield of Seed per Acre.	
						Lb.	Bush.	Lb.
1	Premost (Fallow).......	May 21....	Aug. 25 ...	96	25	784	14	00
2	Novelty (Fallow).......	" 21.....	" 29 ...	100	22	777	13	49
3	Longstem (Fallow).....	" 21.....	" 29 ...	100	32	560	10	00

WINTER WHEAT.

A small field of winter wheat was sown the first week in September but winter killed badly and gave only a small yield per acre.

WINTER RYE.

A field of about ten acres of Prelude stubble was disced in the fall of 1913 and sown to winter rye. It came through the winter in good condition, but, because of the very dry weather, did not give as high yield as in previous seasons. That sown on summer-fallow gave a good growth of straw and a yield equal to any that has been produced.

SHIPMENTS TO OTTAWA.

A shipment of seed grain was made to the Dominion Cerealist at Ottawa. This was sent to augment his supply for free distribution. This season it consisted of:—

	Pounds.
Marquis wheat	6,120
Red Fife wheat	2,510
Pioneer wheat	1,200
O. A. C. No. 21 barley	960
Manchurian barley	7,217
Canadian Thorpe barley	488
Victory oats	340
Novelty flax	224
Longstem flax	160
Arthur peas	2,705
Winter rye	225
Total	22,149

INDIAN HEAD.

EXPERIMENTAL STATION, ROSTHERN, SASK.

WM. A. MUNRO, B.A., B.S.A., SUPERINTENDENT.

THE SEASON.

It is quite evident that it is the moisture which falls between the first of April and the middle of August that most affects the crop, and a glance at the precipitation records for these months for the past four seasons may give insight into the comparative yields of grain for these years.

Following is the precipitation in inches for the past four growing seasons from April 1 to August 15:—

Month.	1911.	1912.	1913.	1914.	Average for Four Years.
	Inches.	Inches.	Inches.	Inches.	Inches.
April	0·86	0·67	0·26	0·63	0·61
May	2·38	2·15	1·26	1·96	1·94
June	3·55	2·81	1·87	2·00	2·56
July	2·89	5·25	3·80	1·40	3·33
Aug. 1-15	0·43	0·23	2·24	0·13	0·76
Total	10·11	11·11	9·43	6·12	9·20

During the latter part of June and July the precipitation in 1914 was considerably below the average. The precipitation throughout the whole season is valuable in crop production, but that in June and July seems particularly important. As a consequence the yields of all grains were below the average in 1914.

SPRING WHEAT.

A number of wheats previously tried and found lacking in yield were discarded in 1914. The following is a table showing most of those tried in 1914 together with a comparison of their yields during three previous seasons. The yield is computed from the yield obtained from one-fortieth acre plots in duplicate.

Variety.	Number of Days Maturing.	Average Length of Straw.	Strength of Straw on scale of 10 Points.	Average Length of Head.	Yield per Acre. 1911.		1912.		1913.		1914.		Average for Four Years.	
		Inches.		Inches.	Bush.	lb.	Bush.	lb.	Bush.	lb.	Bush.	lb.	Bush.	lb.
Marquis	103	38	10	3	70	00	43	20	54	00	45	20	53	10
Bobs	103	36	10	3	62	00	36	00	57	20	51	20	51	40
Huron	105	37	10	3·2	73	20	40	40	45	20	45	40	51	15
Red Fife	105	38	8	2·7	60	00	27	20	36	00	41	40	41	15
Prelude	91	32	10	2	....		29	20	24	00	31	20	....	
Pioneer	91	39	10	3·5	....		28	40	36	00	42	00	....	
Kubanka	107	40	8	3	....		....		16	40	44	40	....	

The average yield of Marquis wheat on eight acres of fallow in 1914 was 30 bushels 35 pounds and the average for three years under the same conditions is 32 bushels 4 pounds.

The average on six acres of fall ploughed stubble-land in 1914 was 16 bushels 6 pounds, and the average for three years is 20 bushels 14 pounds.

The average on two acres of corn stubble following fallow in 1914 was 38 bushels 17 pounds, and the average for three years is 44 bushels 53 pounds.

It is remarkable that the yield is higher and the maturity earlier on corn ground than on fallow.

One acre of Prelude wheat sown on May 13, and harvested on August 9, yielded 23 bushels 55 pounds. The wheat was of No. 1 Northern quality and it matured in 87 days.

OATS.

Following is a table showing a comparison of nine varieties of Oats, seven of which have been grown side by side during the past four years. They were sown on April 23, 1914, on one-fortieth acre plots, on land which had been fallowed in 1913.

Variety.	Number of Days Maturing.	Average Length of Straw.	Strength of straw on scale of 10 Points.	Average Length of Head.	Yield per Acre. 1911.		1912.		1913.		1914.		Average for Four Years.	
		Inches.		Inches.	Bush.	lb.	Bush.	lb.	Bush.	lb.	Bush.	lb.	Bush.	lb.
Abundance..........	94	38	10	6·5	125	30	94	4	132	32	77	22	107	22
Banner.........	94	29	10	5·0	131	26	70	20	145	30	73	18	105	15
Victory	92	34	10	6·0	109	14	83	18	143	18	82	32	104	29
Twentieth Century.. ...	93	31	10	5·5	128	8	68	8	132	32	74	24	101	1
Gold Rain	91	28	10	5·0	127	2	61	6	131	26	83	00	100	26
Ligowo	94	36	10	6·0	121	6	69	14	108	8	80	20	94	25
Eighty Day.	82	25	10	5·0	......		63	18	102	12	75	20	......	
Daubeney....	82	28	10	4·5	101	6	68	8	98	28	68	28	84	9
O. A. C. 72...........	98	42	10	6·0	......		....		....		97	22	....	

O. A. C. 72, a new variety of oats originated by Professor Zavitz of the Agricultural College at Guelph, and promising well in Ontario, was tried at this station for the first time this year. The yield was higher than that of any of the other varieties under test, but it was the latest of all in maturing, and we would hesitate to recommend it for Northern Saskatchewan until further test is made.

The average yield of Banner Oats on 6 acres of fall-ploughed stubble land was 50 bushels 2 pounds, and the average for three years was 64 bushels 27 pounds.

BARLEY.

Seventeen varieties were tested, thirteen of which are given here together with their yields for the past four years. The yield per acre is computed from the yield on a plot of one-fortieth acre. They were sown on May 2, 1914, on land that had been summer-fallowed in 1913.

SIX-ROW VARIETIES.

Variety.	No. of Days Maturing.	Average Length of Straw.	Strength of Straw on scale of 10 Points.	Average Length of head.	Yield per acre. 1911.		1912.		1913.		1914.		Average for Four Years.	
		Inches.		Inches.	Bush.	lb.	Bush.	lb.	Bush.	lb.	Bush.	lb.	Bush.	lb.
O. A. C. 21	94	39	10	4·0	94	8	57	4	73	16	75	00	75	35
Manchurian	94	38	10	3·0	96	32	55	40	00	00	67	24	00	00
Black Japan	94	30	10	2·0	93	16	70	40	58	16	67	24	72	16
Taganrog	94	36	6	2·5	81	32	59	8	53	16	67	4	65	15
Odessa	94	36	10	3·5	100	40	44	8	46	32	67	4	64	33
Stella	94	37	10	3·0	83	16	49	8	50	40	66	12	62	19
Success	83	35	8	2·5	00	00	49	8	31	32	32	36	00	00
Early Indian	82	23	10	2·0	00	00	00	00	11	32	45	40	00	00

TWO-ROW VARIETIES.

Variety.	No. of Days Maturing.	Average Length of Straw.	Strength of Straw on scale of 10 Points.	Average Length of head.	1911.		1912.		1913.		1914.		Average for Four Years.	
Swan's Neck	92	34	7	2·5	78	16	66	32	74	8	77	4	74	3
Duck Bill	91	34	10	3·0	80	16	61	32	67	24	66	42	69	4
Early Chevalier	87	38	8	3·5	79	8	54	28	65	00	54	28	63	16
Swedish Chevalier	94	28	4	4·0	71	32	55	40	56	32	53	16	59	18
Beaver	94	40	8	4·5	70	40	38	15	46	32	45	20	50	15

Early Indian is exceedingly early but short in the straw and a poor yielder, although the very low yield in 1913 is partly due to ravages of birds.

Success is a beardless barley.

Two acres of O. A. C. 21 barley on root ground yielded 37 bushels 35 pounds per acre in 1914 and an average under similar conditions of 45 bushels 35 pounds for three years.

ROSTHERN.

FIELD PEAS.

Ten varieties were under test in 1914, but owing to difficulties in harvesting and threshing, the yields are not to be relied upon. Black-eyed Marrowfat, Prussian Blue, Paragon, and White Marrowfat are all good yielders, but the most satisfactory is the Arthur Select. It is nearly as high a yielder as any and much earlier in maturing.

The following table shows the comparative yield of the ten varieties for the last four years:—

Variety.	No. of Days Maturing.	Length of Straw.	Length of Pod.	Yield per Acre. 1911.	Yield per Acre. 1912.	Yield per Acre. 1913.	Yield per Acre. 1914.	Average for Four Years.
		Inches.	Inches.	Bush. lb.	Bush lb.	Bush. lb.	Bush. lb.	Bush. lb.
Paragon	111	36	2·0	48 00	43 20	13 20	28 00	33 10
Prussian Blue	111	44	1·5	46 40	39 20	18 00	23 20	32 50
Mackay	111	34	2·2	48 00	37 20	16 40	26 40	32 10
Chancellor	108	28	1·7	37 20	36 40	19 20	31 20	31 10
Arthur Select	102	32	2·5	51 20	29 20	18 40	24 40	31 00
Golden Vine	104	36	1·5	24 40	31 20	23 20	40 00	29 50
Wisconsin Blue	111	32	2·0	31 20	32 00	21 20	31 20	29 00
English Grey	111	34	2·0	38 00	25 20	14 40	26 40	26 10
Black Eyed Marrowfat	111	33	2·0	26 20	24 20	16 40	32 40	25 00
Gregory	111	32	1·7	00 00	33 20	21 20	27 20	00 00

ROSTHERN.

EXPERIMENTAL STATION, SCOTT, SASK.

MILTON J. TINLINE, B.S.A., ACTING SUPERINTENDENT.

WEATHER CONDITIONS.

The summer of 1914 has been recorded as the driest in the history of the district, the total rainfall from April 1 to August 15 being only 7·22 inches. The rain fell in numerous small showers, and seldom penetrated to the roots of the grain crops. The hot dry winds which prevailed during the period when the crops were heading out, together with the high temperatures, hastened the crops to maturity at the expense of the yield.

TESTS WITH CEREALS.

The cereal tests were conducted on a field that had been summer-fallowed in 1913. The soil is a dark chocolate loam, and very uniform. The plots were one-fortieth of an acre in area.

SPRING WHEAT.

Six named varieties of spring wheat were sown on April 17, at the rate of 1¾ bushels per acre. The following are the resultant yields:—

Number.	Variety.	Number of Days Maturing	Average Length of Straw.	Average Strength of Straw, Scale of 10 Points.	Length of Head.	Yield per Acre, 1914.		Average Yield per Acre, Three Years.	
			Inches.		Inches.	Bush.	Lb.	Bush.	Lb.
1	Red Fife	118	26·0	8	2·0	20	20	27	23
2	Marquis	115	24·0	9	3·0	19	—	26	23
3	Huron Selected	115	22·0	8	2·7	18	31	27	55
4	Alpha Selected	115	23·5	9	2·5	18	—	22	6
5	Pioneer (195 F)	110	25·0	9	2·0	14	20	16	20
6	Prelude	106	22·0	9	1·7	10	—	13	13

OATS.

Seven varieties of oats were sown on May 8, at the rate of 2½ bushels per acre:—

Number.	Variety.	Number of Days Maturing.	Average Length of Straw.	Average Strength of Straw, Scale of 10 Points.	Length of Head.	Yield per Acre, 1914.		Average Yield per Acre, Three Years.	
			Inches.		Inches.	Bush.	Lb.	Bush.	Lb.
1	Banner	101	24	9	7·7	51	6	80	32
2	Twentieth Century	99	30	10	6·5	41	6	83	15
3	Ligowo (Swedish)	97	30	8	6·0	32	12	85	14
4	Tartar King	99	31	10	7·0	32	12	76	18
5	Abundance (Regenerated)	97	30	10	6·0	27	2	77	14
6	Eighty Day	90	30	10	6·0	24	24	65	33
7	Daubeney	92	28	9	6·0	22	32	58	33

BARLEY.

Four varieties of six-row and three varieties of two-row barley were sown on May 1, at the rate of 2 bushels per acre:—

Number.	Variety.	Number of Days Maturing.	Average Length of Straw.	Average Strength of Straw. Scale of 10 Points.	Length of Head.	Yield per Acre, 1914.		Average Yield per Acre for Three Years.	
	Six-row.		Inches.	.	Inches.	Bush.	Lb.	Bush.	Lb.
1	Black Japan........	96	22·0	9	3·0	20	40	31	16
*2	Success (Beardless).......	122	21·0	8	2·7	15	30	13	38
3	O. A. C. No. 21..........	101	23·0	9	2·7	14	28	34	34
4	Manchurian..............	104	22·0	9	2·5	10	00	30	13
	Two-row.								
1	Brewer........	106	21·5	8	2·7	28	16	00	00
2	Duckbill....	106	21·0	7	2·7	25	40	50	43
3	Early Chevalier	96	22·0	8	2·0	17	4	35	16

* The Success Barley is usually the earliest. This season, however, the late summer rains started a second growth in this variety.

PEAS.

Four varieties of peas were sown on May 1, at the rate of 2½ bushels per acre, and harvested on August 18:—

Number.	Variety.	Yield per Acre of Grain and Straw.	Yield per Acre, 1914.		Average Yield per Acre.		
		Lb.	Bush.	Lb.	Bush.	Lb.	
1	Chancellor.......	2086	20	00	24	00	2 years
*2	Arthur....	2920	18	00	27	16	3 "
3	English Grey..........	4320	18	00	23	00	3 "
4	Golden Vine.............	2200	15	2	23	33	3 "

* The Arthur variety is to be recommended for Northwestern Saskatchewan on account of its earliness, and yield of grain per acre.

Scott.

SPRING RYE.

One plot of Ottawa selected spring rye was sown on April 17, at the rate of 1½ bushels per acre. The crop was harvested August 6, and yielded 18 bushels per acre.

SUMMARY of Grain, Suitable for Seed Purposes, Grown 1914; and Amounts Sold During Season 1914-15.

Variety.	Amount of Seed Grown 1914.	Amount of Seed Sold 1914-15.	Number of Farmers Supplied 1914-15.
	Bush.	Bush.	
Marquis Wheat	132	84	5
Banner Oats	75	35	7
Ligowo Oats	114	45	7
Arthur Peas	70	52	12
Total	391	216	31

EXPERIMENTAL STATION, LETHBRIDGE, ALBERTA.

W. H. FAIRFIELD, M.S., SUPERINTENDENT.

REPORT ON CEREALS.

On account of the excessive drought the season of 1914 has been, with the possible exception of 1910, when the area affected was more restricted, the most trying that has been experienced in Southern Alberta, since settlement has taken place. The fall of 1913 was rather dry. Much windy weather was experienced during the late fall and early winter. During January, February, and March the precipitation was heavier, so that when the spring's work began there was a fair amount of moisture in the soil.

The first discing, harrowing, or seeding on the Station occurred March 17. The ground froze up toward the latter part of March, but opened up again shortly and seeding became general about April 4. Unfortunately the rainfall during April, May, and until the latter part of June was very much less than usual. For this entire period, no soaking rain was experienced, what did come was in the form of light showers that were not sufficient to wet through the dry layer of two or three inches at the surface and connect with the moisture lower down. The fact that the total precipitation for April was only 0·5 and for May 0·3 of an inch fully illustrates how serious conditions were and how difficult it was to obtain a stand from seeds when sown. A wet spell during the last ten days of June revived things generally, but the dry, hot July was too severe a strain on plant life and the result was that there was a failure of all grain crops except those on summer-fallow. The last frost in the spring occurred on May 12 when a temperature of 29·8° was recorded. The first frost in the fall was on September 15 when the temperature dropped to 31°.

As in past seasons the varietal tests with the different grains have been carried on both with and without irrigation, and to avoid confusion the report is divided into two parts. The first deals with the part of the farm on which no irrigation is applied.

PART I.—NON-IRRIGATED OR "DRY" FARM.

EXPERIMENTS WITH WINTER WHEAT.

The area seeded to winter wheat in the district was very much smaller than has been the case in past years. This decrease is largely due to drought and to the presence of a disease, quite generally prevalent in the winter wheat fields in the southern part of the province, the exact nature of which has not yet been discovered.

TEST OF VARIETIES.

Ten varieties of winter wheat were sown on summer-fallow on the 3rd of September, 1913. There did not appear to be a great deal of winter-killing, but owing to the dry conditions they never assumed a very thriving appearance in the spring. They did not appear to be diseased to any appreciable extent, but the dry weather during May and early June affected them in a marked degree and they were so advanced when the rains of late June came that they could not recover much and the yield in consequence was lighter than was the case with spring wheat.

WINTER WHEAT (Non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw, including Head.	Weight of Straw.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
					Inches.	Lb.	Inches.	Lb.	Bush.	Lb.	Lb.
1	Buffum No. 17........	Sept. 3	July 22	321	27·0	2,505	3·0	1,305	21	45	60·0
2	Minnesota No. 529....	" 3	" 23	322	26·0	2,205	2·75	1,275	21	15	60·0
3	Kansas Red.	" 3	" 19	318	27·0	2,070	2·5	1,200	20	00	61·0
4	Dawson's Golden Chaff	" 3	" 20	319	29·0	1,680	3·0	1,200	20	00	59·0
5	Kharkov	" 3	" 18	317	22·5	1,680	2·5	1,080	18	00	61·0
6	Egyptian Amber. . ..	" 3	" 22	321	29·0	1,950	3·0	1,080	18	00	59·5
7	Azima	" 3	" 18	317	24·0	1,965	2·5	1,005	16	45	58·0
8	Ghirka.............	" 3	" 20	319	26·0	1,755	2·75	1,005	16	45	60·0
9	Minnesota No. 561...	" 3	" 18	317	25·0	1,485	2·5	975	16	15	60·5
10	Tasmania Red........	" 3	" 22	321	28·0	1,410	3·0	810	13	30	58·0

EXPERIMENTS WITH SPRING WHEAT.

Nine varieties were tested. They were sown on summer-fallow. Considering the very dry season the yields were quite satisfactory. The area of each plot was one-sixtieth of an acre. Only the named varieties are mentioned in the table:—

SPRING WHEAT (Non-irrigated).—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw, including Head.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
					Inches.	Inches.	Lb.	Bush.	Lb.	Lb.
1	Early Russian................	April 6	July 28	112	31·0	3·0	1,530	25	30	60·7
2	Marquis..................	" 6	" 28	112	30·0	3·5	1,470	24	30	62·5
3	Early Red Fife..........	" 6	" 29	113	29·0	3·5	1,470	24	30	62·0
4	Marquis (Plot for chemist) ..	" 6	" 28	112	30·0	3·0	1,455	24	15	62·0
5	Huron........	" 6	" 29	113	31·0	2·7	1,455	24	15	60·5
6	Bobs.................... .	" 6	" 25	109	27·0	3·0	1,395	23	15	63·0
7	Pioneer....	" 6	" 24	108	27·5	2·5	1,230	20	30	61·0
8	Kubanka	" 6	" 31	115	34·0	2·5	1,230	20	30	62·0
9	Red Fife.....................	" 6	Aug. 1	116	30·0	3·0	1,170	19	30	59·7
10	Prelude...........	" 6	July 20	104	23·0	2·2	540	9	00	60·0

LETHBRIDGE.

EXPERIMENTS WITH OATS.

Ten varieties of oats were tested, being sown on summer-fallow.

OATS (Non-irrigated).—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing	Average Length of Straw including head	Average Length of head.	Weight of Straw.	Yield per acre.	Weight per Measured Bushel after Cleaning.	Average yield for Six Years.
					Inches.	Inches.	Lb.	Bush. lb.	Lb.	Bush. lb.
1	Abundance	April 21	July 28	98	26·0	4·7	1,860	60 30	40·0	00 00
2	Banner	" 21	" 31	101	27·0	6·0	1,455	48 33	33·0	59 21
3	Danish Island	" 21	" 31	101	26·0	5·5	1,590	45 00	36·0	60 5
4	Swedish Select (Imp.)	" 21	Aug. 2	103	31·0	6·0	1,695	36 21	39·0	00 00
5	Lincoln	" 21	" 4	105	24·0	5·5	1,140	35 10	35·0	58 33
6	Gold Rain	" 21	" 4	105	26·0	4·7	1,125	33 5	35·5	00 00
7	Victory	" 21	" 4	105	22·0	5·0	1,050	30 00	35·5	81 23
8	Irish Victor	" 21	" 5	106	19·5	5·2	1,050	25 20	35·0	57 22
9	Ligowo, Swedish	" 21	" 4	105	26·0	6·0	1,020	24 24	34·0	00 00
10	Daubeney	" 21	July 24	94	19·0	5·0	900	22 32	32·0	00 00

EXPERIMENTS WITH BARLEY.

Six varieties of six-rowed and six varieties of two-rowed barley were tested They were all sown on summer-fallow. One feature concerning the results is of some interest, namely that the six-rowed varieties have outyielded the two-rowed. As a rule there has not been much difference between them in the past; in fact, the two-rowed varieties have often outyielded the six-rowed.

SIX-ROW BARLEY (Non-irrigated).—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Weight of Straw.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.	Average for Six Years.	Weight per measured bushel.
					In.	Lb.	In.	Lb.	Bush. lb.	Bush. lb.	Lb.
1	Odessa	April 21	July 28	98	23·0	1,140	2 5	2,040	42 24	39 12	47
2	Mansfield	" 21	" 31	101	24·0	1,740	2 2	1,560	32 21	32 28	45
3	O. A. C. No. 21	" 21	" 31	101	22·0	1,695	2 5	1,545	32 9	00 00	42
4	Claude	" 21	Aug 2	103	24·0	1,740	2 0	1,440	30 00	34 26	48
5	Manchurian	" 21	July 31	101	24·5	1,920	3 0	1,200	25 00	00 00	40
6	Guymalaye	" 21	" 26	96	17·5	1,36	1·7	1,155	24 3	00 00	53

Two-row Barley (Non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw, Including Head.	Weight of Straw.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Average for six Years.		Weight per Measured Bushel after Cleaning.
					In.	Lb.	In.	Lb.	Bush.	lb.	Bush.	lb.	Lb.
1	Gold C. E. F. . .	April 21	Aug. 5	105	17	1,545	2·5	1,455	30	15	00	00	52
2	Invincible.	" 21	" 5	105	19	1,785	2·5	1,335	27	39	37	2	50
3	Swedish Chevalier.	" 21	" 5	105	19	1,770	3·5	1,230	25	30	37	47	49
4	Early Chevalier. . .	" 21	July 25	94	25	1,815	2·7	1,185	24	33	00	00	50
5	Clifford	" 21	" 31	100	27	2,100	3·2	1,140	23	36	29	28	50
6	Duckbill C. E. F . .	" 21	Aug. 5	105	19	1,680	2·5	960	20	00	00	00	50

EXPERIMENTS WITH PEAS.

Ten varieties of field peas were tested. They were sown on summer-fallow.

Peas (Non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.	Average age for six Years.	
					In.	In.	Lb.	Bush.	lb.	Lb.	Bush.	lb.
1	Paragon	April 9. .	Aug. 4. .	117	25·5	2·2	1,260	21	00	63·5	00	00
2	Picton	" 9. .	" 3. .	116	26·0	2·0	1,200	20	00	64·5	00	00
3	Prince	" 9. .	" 4. .	117	24·0	2·0	1,200	20	00	63·5	26	48
4	Golden Vine. . . .	" 9. .	" 1. .	114	20·0	1·5	1,170	19	30	64·0	23	35
5	Arthur	" 9. .	July 30. .	112	23·0	2·0	1,140	19	00	63·5	24	2
6	Chancellor	" 9. .	" 31. .	113	21·0	1·7	1,110	18	30	63·0	23	23
7	Mackay	9. .	Aug. 5. .	118	22·5	1·7	1,110	18	30	64·0	00	00
8	English Grey	" 9.	" 1. .	114	21·0	1·7	1,020	17	00	65·0	25	16
9	Prussian Blue.	" 9. .	" 6. .	119	23·0	2·2	1,020	17	00	65·5	26	33
10	Solo (Brandon). . . .	" 9. .	July 26. .	108	18·0	2·0	960	15	00	64·0	00	00

FLAX.

All of the flax sown was injured so seriously by the land drifting and cutting the young plants off that no results were obtained. Summer-fallow was used in each case.

PART II (IRRIGATED FARM).

The yields of the varieties of grain under irrigation were quite satisfactory and the quality was excellent.

EXPERIMENTS WITH WHEAT.

Six varieties were tested. They were sown on land that was in roots in 1913. They were irrigated twice, June 3 and July 14.

SPRING WHEAT (Irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Weight of Straw.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after cleaning.	Average for seven Years.	
					In.	Lb.	In.	Lb.	Bush.	lb.	Lb.	Bush.	lb.
1	Marquis..........	April 6	Aug. 3	119	39·0	3,795	3.5	3,225	53	45	63·5	46	00
2	Marquis (Plot for chemist)	" 7	" 3	119	38·0	3,660	3·5	3,180	53	00	63·0	00	00
3	Red Fife........	" 7	" 3	119	41·0	4,035	3·2	2,865	47	45	61·5	44	29
4	Huron..........	" 7	" 1	117	38·5	3,450	2·5	2,610	43	30	63·0	51	4
5	*Pioneer	" 6	July 28	114	38·0	3,195	3·2	2,565	42	45	63·5	00	00
6	*Prelude	" 6	" 21	107	31·0	2,655	2·5	1,875	31	15	60·5	00	00

*Shelled a little.

EXPERIMENTS WITH OATS.

Six varieties were tested. They were sown on land that was in roots in 1913. They were irrigated twice, June 3 and July 14.

OATS (Irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Average Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Average Yield for 7 Years.	
					In.	In.	Lb.	Bush.	lb.	Lb.	Bush.	lb.
1	Banner	April 21..	Aug. 11..	112	39	7·5	3,270	113	13	40·0	99	2
2	Danish Island....	" 21..	" 11.	112	42	7·5	3,240	109	29	39·0	97	24
3	Irish Victor......	" 21..	" 13..	114	42	7·7	3,465	102	27	38·0	98	12
4	Swedish Selected (Imp.).	" 21..	" 12..	113	37	7·0	3.105	97	17	40·5	00	00
5	Abundance (Garton's Regen.)	" 21..	" 13..	114	37	6·5	2,880	93	18	41·5	00	00
6	Daubeney	" 21.	" 4..	105	35	6·0	1,770	69	24	36·0	00	00

Cutworms damaged the plots in varying degrees.

LETHBRIDGE.

EXPERIMENTS WITH BARLEY.

Six varieties of six-rowed and six varieties of two-rowed were tested. They were sown on land that was in roots in 1913. They were irrigated twice, June 3 and July 14.

Six-row Barley (Irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw Including Head.	Weight of Straw.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Average for seven Years.		Weight per Measured Bushel.
					In.	Lb.	In.	Lb.	Bush.	lb.	Bush.	lb.	Lb.
1	Claude...........	April 21	Aug. 1	101	34·0	3,390	2·5	4,680	97	24	74	15	48·5
2	Guymalaye........	" 21	July 28	97	26·0	2,730	2·5	3,600	75	00	00	00	52·0
3	O.A.C. No. 21.....	" 21	" 29	98	31·5	2,325	2·2	3,255	67	39	00	00	48·0
4	Odessa.........	" 21	" 31	100	32·0	2,640	2·5	3,210	66	42	62	37	52·0
5	Manchurian......	" 21	Aug. 1	101	34·0	2,955	3·0	3,030	63	6	00	00	47·0
6	Mansfield......	" 21	" 2	102	32·0	3,435	2·5	3,000	62	24	59	17	51·0

Two-row Barley (Irrigated)—Test of Varieties.

Number.	Name of Variety	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw, Including Head.	Weight of Straw.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
					In.	Lb.	In.	Lb.	Bush.	lb.	Lb.
1	Swedish Chevalier..............	April 21	Aug. 5	105	33·0	3,540	3·0	4,350	90	30	55
2	Gold (C.E.F.)............	" 21	" 4	104	30·0	3,225	2·7	4,185	87	9	55
3	Invincible	" 21	" 5	105	30·0	3,285	2·5	3,975	82	39	55
4	Duckbill (C.E.F.)...........	" 21	" 4	104	36·0	4,005	2·5	3,045	63	21	54
5	Early Chevalier.............	" 21	July 27	96	35·0	2,880	2·7	2,610	54	18	53
6	Clifford.......................	" 21	" 31	100	35·5	3,420	3·5	2,580	53	36	53

EXPERIMENTS WITH PEAS.

Ten varieties were tested. They were sown on land that was in roots in 1913. They were irrigated twice, June 3 and July 14.

PEAS (irrigated).

Number.	Name of Variety.	Size of Plot.	Date of Sowing.		Date of Ripening.		Number of days Maturing.	Average Length of Straw.	Average length of Pod.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Average Yield for Seven Years.	
								In.	In.	Lb.	Bush.	lb.	Lb.	Bush.	lb.
1	Prince	1-60 acre	April	9	Aug.	9	122	43	2·0	3,720	62	00	67·0	41	39
2	Solo (from Brandon)	"	"	9	"	6	119	45	2·2	3,360	56	00	64·5	00	00
3	Paragon	"	"	9	"	8	121	36	2·0	3,240	54	00	68·0	45	25
4	Picton	"	"	9	"	8	121	40	2·0	3,120	52	00	65·0	38	50
5	Prussian Blue	"	"	9	"	10	123	46	2·2	3,120	52	00	68·0	35	56
6	Mackay	"	"	9	"	6	119	40	1·7	3,060	51	00	66·5	42	35
7	Chancellor	"	"	9	"	5	118	38	1·7	2,880	48	00	65·0	34	37
8	Golden Vine	"	"	9	"	6	119	38	1·7	2,850	47	30	66·0	36	7
9	Arthur Selected	"	"	9	"	2	115	38	1·7	2,790	46	30	68·0	00	00
10	English Grey	"	"	9	"	10	123	36	2·0	2,790	46	30	64·5	38	36

LETHBRIDGE.

EXPERIMENTAL STATION, LACOMBE, ALBERTA.

G. H. HUTTON, B.S.A., SUPERINTENDENT.

CEREAL DIVISION.

The season of 1914 was an average one at Lacombe both as to date on which seeding began and general conditions of moisture and temperature. The first grain was sown on April 15, on which date all the varieties of wheat were seeded. The conditions were favourable for growth throughout the season, the first frost occurring on September 1, at which time the bulk of the grain was cut and therefore out of danger. The mean temperature for the summer months was slightly higher than usual and this slight variation towards higher temperatures had a more perceptible effect in hastening maturity of grain than would be expected from the extent of this upward variation of temperature. The precipitation for the months of April, May, June, July and August was 9·905 inches, which proved sufficient for the needs of all cereals.

WINTER WHEAT.

A yield of 33 bushels per acre of Kharkoff winter wheat was secured on Rotation "L." This land was ploughed out of timothy and alsike clover sod in July of 1913, thoroughly worked down with a disc and drag harrow and seeded at the rate of 1¾ bushels to the acre about the middle of August. It has been our experience that winter wheat sown on sod has been more likely to come through the winter and spring satisfactorily than if sown on summer-fallow.

SPRING WHEAT.

Fifteen varieties of spring wheat were sown on black clay loam which had produced a crop of field roots the previous season. This land was not ploughed after the roots were harvested in preparation for cereals but was prepared by the use of the disc and drag harrows. We find that the ploughing of root ground is altogether unnecessary and that a fairly firm seed bed, particularly for wheat, gives better results than a too open soil. The seed was sown at the rate of three bushels per acre in plots one-fortieth of an acre in size on April 15. Germination was prompt and growth normal throughout the season. Marquis and Prelude are varieties well suited for the conditions in this part of Central Alberta. Those districts in which Marquis is proving sufficiently early should continue to grow that variety. Where an earlier wheat than Marquis is desired, then Prelude should be the variety selected. On a field of eight acres in 1914, Prelude wheat yielded at the rate of twenty-eight bushels per acre and ripened sixteen days earlier than Marquis.

Only the named varieties are mentioned in the following table:—

SPRING WHEAT.—Field Lots for Seed.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw, Including Head.	Strength of Straw on a scale of 10 Points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
					In.		In.	Lb.	Bush.	lb.	Lb.
1	Early Russian	April 15	Sept. 4	142	43	5·0	3·0	4,300	71	40	61·0
2	Huron	" 15	" 6	144	49	10·0	3·7	3,900	65	00	61·5
3	Bishop	" 15	" 4	142	43	8·5	3·2	3,800	63	20	60·0
4	Bobs.	" 15	" 4	142	41	9·0	3·2	3,570	59	30	62·0
5	Marquis	" 15	" 6	144	45	10·0	3·2	3,550	59	10	62·7
6	Red Fife	" 15	" 6	144	48	9·0	3·2	3,490	58	10	58·5
7	Pioneer	" 15	" 4	142	41	6·0	2·7	3,460	57	40	63·5
8	Prelude	" 15	Aug. 20	127	37	9·0	2·0	2,200	36	40	64·0

SPRING WHEAT.—Field Lots for Seed.

Variety.	Area.	Total Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Marquis	6	234	39
Prelude	8	224	28

SPRING RYE.

One plot of spring rye was sown on black clay loam soil prepared by the use of the disc and drag harrows following roots in 1913. The plot was sown April 15 at the rate of three bushels per acre and was harvested August 29, and gave a yield of forty bushels and forty pounds per acre.

OATS.

Twelve varieties of oats were tested at Lacombe in 1914. The plots were one-fortieth of an acre in extent and were sown on the 16th of April on land which was surface cultivated following field roots in 1913. The amount of seed used varied according to the size of the kernel of the oat from three and a half to four and a quarter bushels per acre:—

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw Including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured Bushel after Cleaning.
				In.		In.	Lb.	Bush.	lb.	Lb.
1	Banner	Aug. 29	137	49·5	10·0	9·0	3,960	116	16	44·0
2	Danish Island	" 29	137	49·0	10·0	8·2	3,600	105	30	43·5
3	Irish Victor	Sept. 4	143	49·0	10·0	9·0	3,400	100	10	45·0
4	Siberian	Aug. 29	137	50·0	9·5	8·0	3,330	97	32	43·0
5	Victory	Sept. 4	143	48·0	10·0	8·0	3,280	96	16	43·5
6	Tartar King	" 4	143	44·0	10·0	10·0	3,280	96	16	42·0
7	Swedish Select	" 2	141	48·0	10·0	8·0	3,020	88	28	44·0
8	Regenerated Abundance	Aug. 29	137	47·0	10·0	7·7	3,010	88	18	45·5
9	Gold Rain	" 29	137	53·0	10·0	8·7	2,360	69	14	43·5
10	Daubeney	" 20	128	42·5	9·5	5·5	2,320	68	8	41·0
11	Eighty Day	" 17	125	38·3	9·5	5·2	1,930	56	26	37·5
12	Ligowo	" 29	137	49·0	10·0	9·0	1,920	56	16	42·0

OATS.—Field Lots for Seed.

Variety.	Area.	Total Yield.	Yield per Acre.
	Acres.	Bush.	Bush.
Banner	4·25	272	64
Abundance	35·0	1,925	55

BARLEY.

Ten varieties of six-row and five varieties of two-row barley were tested in 1914. Seed was sown April 16, at the rate of from three to three and one-half bushels per acre. The land—a clay black loam—having been in roots in 1913 was not ploughed, but disced and drag harrowed before being sown. All plots were one-fortieth of an acre in extent. The quality of the grain produced in 1914 was excellent. Only the named varieties are mentioned in the tables.

Two-row Barley.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.		Date of Ripening.		Number of Days Maturing.	Average Length of Straw, Including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
							In		In.	Lb.	Bush.	lb.	Lb.
1	Swedish Chevalier....	April	16	Aug.	28	136	36·0	7·0	3·2	4,120	85	40	54
2	Invincible.....	"	16	"	20	128	38 0	8·5	3·2	3,430	71	22	53
3	Gold...	"	16	"	28	136	32·0	10 0	2·2	3,420	71	12	55
4	Early Chevalier.......	"	16	"	17	125	46 5	8·5	3·7	2,220	46	12	53
5	Swan's Neck...	"	16	"	17	125	44·5	8·0	3·0	2,200	45	20	52

Six-row Barley.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.		Date of Ripening.		Number of Days Maturing.	Average Length of Straw, Including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
							In.		In.	Lb.	Bush.	lb.	Lb.
1	Mansfield............... ..	April	16	Aug	21	129	40·5	8 5	2·7	3,500	72	44	53
2	Odessa	"	16	"	20	128	39·0	6 0	3·2	3,450	71	42	53
3	Manchurian.....	"	16	"	21	129	44·0	9·5	4·5	3,320	69	8	50
4	O. A. C. 21........... ...	"	16	"	21	129	48·0	9 5	3·0	3,230	67	14	51
5	Stella.....................	"	16	Sept.	4	143	45·0	10·0	4 2	2,830	58	46	52
6	Guymalaye.................	"	16	Aug.	28	136	32·0	9·0	2 5	1,660	34	28	59
7	Success (beardless)..........	"	16	"	17	125	38 5	6 0	2·7	480	10	00	49

FIELD PEAS.

Cutworms destroyed the growth of all crops of peas, therefore it is impossible to report upon them. An acre of Arthur peas produced a yield of thirty bushels per acre. It is believed that this variety will be found valuable for sowing with oats for the production of green feed. Stock men occasionally raise the objection that the mixing of peas with oats for green feed, considering the cost of seed peas, is prohibitive. It is expected that Arthur peas will ripen almost invariably, and if a small area of peas alone were grown for the production of seed it would overcome this objection.

Lacombe.

SUB-STATIONS IN ALBERTA.

ST. BERNARD MISSION, GROUARD, ALBERTA.

Rev. Bro. Laurent, Experimentalist.

THE SEASON.

The summer and autumn of 1913 were so wet that it was impossible to prepare the land in any way for the crops of this year until the 18th of April, when ploughing was commenced.

Seeding was finished early in May, and a few days of warm weather caused the grain to germinate quickly. During the latter half of May the young plants suffered somewhat from the violent winds which continued without intermission until the 3rd of June. On June 4 there came a heavy rainstorm, after which the growth of cereals was rapid. Barley began to head out at the end of that month. Wheat and oats were in head by July 15.

SPRING WHEAT.

Prelude yielded 25 pounds from 5 pounds of seed, and was ripe on August 20. The threshed wheat weighs 62 pounds to the measured bushel.

Early Red Fife, sown April 30, on stubble, was ripe August 18, and gave 27 bushels per acre.

Marquis, sown May 1, on stubble, was ripe August 26, and yielded 29·25 bushels per acre. Weight of a measured bushel, 59 pounds.

Preston, sown May 1, on stubble, was ripe August 26, and yielded 28 bushels per acre.

OATS.

Eighty Day, sown April 30, was ripe on August 1. The total yield, from 4 pounds of seed, was 45 pounds, and the weight per measured bushel was 27 pounds.

Abundance was ripe on August 16. Four pounds of seed yielded 40 pounds; and the weight per measured bushel was 35·3 pounds.

Banner, sown May 2, on stubble, was ripe on August 15, and yielded 45 bushels per acre.

BARLEY.

Manchurian barley sown on the 2nd of May was ripe on the 10th of August, and yielded at the rate of 40 bushels to the acre. Weight of a measured bushel 44·8 pounds.

EXPERIMENTAL STATION, FORT VERMILION, ALBERTA.

R. Jones, Manager.

THE SEASON.

April opened with rough weather, but turned fine towards the end of the month. Seeding commenced on the 30th. May was dry, with considerable wind June was somewhat dry, but there was enough rain to cause a good growth of cereals Further rains occurred early in July, but the month as a whole was dry and hot. August was quite warm and rather showery. Harvesting commenced on July 22.

SPRING WHEAT.

Nine varieties were tested in one-thirtieth acre plots, on land on which roots had been grown the previous year. The seed was sown on April 30 and May 1 at the rate of 1¾ bushels per acre.

Spring Wheat—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Average Length of Straw including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of Straw per acre.	Yield of Grain per Acre.		Weight per Measured bushel after Cleaning.
					In.		In.	Lb.	Bush.	lb.	Lb.
1	Bishop	May 1	Aug. 12	104	38	5	3·0	6,000	63	00	63·4
2	Ladoga	" 1	" 10	102	39	5	3·0	4,200	57	00	60·8
3	Early Riga	" 1	" 7	99	36	10	3·0	4,320	56	30	61·5
4	Red Fife	April 30	" 18	111	42	7	3·2	4,640	52	00	61·5
5	Marquis	May 1	" 14	106	40	10	3·0	5,220	51	00	64·0
6	Preston	" 1	" 13	105	36	5	3·0	5,760	50	00	62·8
7	Prelude	" 1	" 4	96	39	10	2·5	3,960	49	00	63·2
8	Kubanka	" 1	" 31	112	44	5	2·5	5,280	46	00	00·0
9	Stanley	" 1	" 11	103	36	10	3·5	5,280	41	00	61·0

OATS.

Five varieties were sown. The plots were one-thirtieth of an acre. The previous crop was corn, for which manure had been applied. The land was ploughed in the fall of 1913 and well worked up in the spring of 1914. The oats were sown on May 2 and 4 at the rate of 2½ bushels to the acre.

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Average Length of Straw including Head.	Strength of Straw on a Scale of 10 Points.	Average length of Head.	Yield of Straw per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
					In.		In.	Lb.	Bush.	lb.	Lb.
1	Excelsior Black	May 4	Aug. 10	98	42	10	7·0	7,200	120	00	39·5
2	Tartar King	" 4	" 6	94	46	6	9·0	7,200	107	23	38·5
3	Imp. Ligowo	" 4	" 8	96	48	10	9·0	7,200	100	20	39·2
4	Banner	" 2	" 3	93	43	7	7·0	7,800	98	28	38·0
5	Bla k Mesdag	" 4	July 25	82	40	5	8·5	4,500	60	00	30·4

BARLEY.

Four varieties of six-row and two of two-row barley were tested this year in one-thirtieth acre plots, on land on which potatoes had been grown the previous year, and which had been manured in the spring of 1913, ploughed the following fall, and well worked up in the spring of 1914.

The barley was sown on the 6th and 7th of May (except Hulless White which was sown on May 21) at the rate of $2\frac{1}{4}$ bushels to the acre.

BARLEY.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of grain per Acre.	Yield of grain per acre.		Weight per measured bushel after cleaning.
					In.		In.	Lb.	bush.	lb.	Lb.
	Six R w—										
1	Claude	May 6	July 30	85	40	7	3·0	4,860	57	24	45·0
2	Mensury	" 6	Aug. 1	87	36	5	2·5	5,280	55	00	48·0
3	Hulless	" 21	" 21	92	36	7	2·5	6,060	53	36	65·1
4	Success	" 6	July 28	83	36	5	3·0	2,400	51	12	
	Two Row—										
1	Canadian Thorpe	May 7	Aug. 3	88	40	7	2·7	4,820	62	24	52·4
2	Sidney	" 7	" 15	90	36	5	2·5	4,260	61	12	53·0

PEAS.

Two varieties of peas were sown. Arthur gave good results. It was sown on May 5 and harvested on August 10, and gave a crop at the rate of 45 bushels per acre.

BUCKWHEAT.

Two varieties of buckwheat were tested, Silverhull and Japanese. These were sown on May 21. The Japanese was quite green when frost occurred on September 7. The Silverhull was ready to cut August 26, and yielded at the rate of 40 bushels per acre.

FORT VERMILION.

EXPERIMENTS AT FORT RESOLUTION, MACKENZIE DISTRICT.

The winter was long and severe, and spring was late. Soil conditions were, however, satisfactory when the warmer weather came.

Seeding was done from the 20th to the 30th of May. The weather in June and July was very favourable but August was rather cool. Severe storms were experienced early in September.

The harvest was gathered between September 15 and 20. The first very severe frost was on September 22.

The following varieties of cereals were tested:—

Spring Wheat—Marquis and Prelude.

Oats—Eighty Day.

Barley—Manchurian.

They were all sown on May 22 and cut on September 17.

EXPERIMENTAL STATION, INVERMERE, B.C.

GEO. E. PARHAM, SUPERINTENDENT.

Arrangements have been completed to commence variety tests of cereals at this station next season. A suitable piece of land has been set apart for this purpose.

Two principal series of tests will be carried on, in one of which a greater amount of water will be applied than in the other. These experiments will include varieties of wheat, oats, barley and peas.

EXPERIMENTAL FARM, AGASSIZ, B.C.

P. H. MOORE, B.S.A., SUPERINTENDENT.

WEATHER.

In April of this year we had less than three inches of rain and seeding was commenced about the same time as usual. The first seeding was done on April 18 and all plots were sown by the night of April 22. The month of May was comparatively dry and bright; June was wet in the fore part and a heavy shower occurred on the 27th. From this shower in June until the grain was cut in August, there was not enough rain to settle the dust. Below we give a table showing the precipitation, temperatures, etc., during the growing season.

1914.	April.	May.	June.	July.	August. 1-6	Totals.
Precipitation	2·94 inches.	3·55 inches	5·18 inches	0·15 inches	....	11·82 inches
Sunshine	143 hrs. 54 min.	202 hrs.	176 hrs. 18 min.	246 hrs. 54 min.	41 hrs. 18 min.	810 hrs. 24 min.
						Averages.
Highest temperature	72°	85°	87°	87°	80°	82·2°
Lowest temperature	31°	36°	41°	39°	44°	38·2°
Mean monthly temperature	51·55°	56·28°	52·91°	62 075°	77·16°	59·99°

Such a season gave very good results until the grain headed out, but from that time the ripening was too much hastened to secure the largest yields. However, the colour and quality of the straw and grain could not be surpassed, and both were much above the average for this valley.

LAND AND TREATMENT.

The cereal variety test plots, with the exception of peas, were put on a piece of sandy loam in the northeast section of the Farm. This piece of land had for many years been under orchard. In 1911 it was spring ploughed, sown to oats, and seeded to clover. In 1912 it was pastured and fall ploughed; in 1913 it was dressed with 16 tons of barnyard manure and 600 pounds of chemical fertilizer per acre and planted to mangels. In 1914 it was spring ploughed, harrowed, rolled and seed sown in plots, and the whole seeded down to clover.

The peas were sown on a piece of fall ploughed pasture land of sandy nature, which did not have an application of manure of any kind.

Smut did not make an appearance this year, but, as usual, all grains subject to it were given the formaldehyde treatment.

FORMALDEHYDE TREATMENT OF GRAIN.

The method used at this farm in combating smut in grain is as follows:—

The grain is immersed in a solution of one-half (½) pint of formaldehyde to 40 gallons of water; the solution is put in a barrel and the sacks of grain are allowed to stand in it until they become thoroughly soaked. The barrel is constantly kept covered with a wet sack to prevent the formaldehyde from evaporating. After being treated, the grain is spread on a dry floor, and when dry is sacked up.

SPRING WHEAT.

On account of the semi-failure of this crop for the past few years, caused by the "wheat midge," the test plots were discontinued in an effort to try to starve out the insect; but it was found that the insect lived on the barley in sufficient numbers to perpetuate its species.

OATS.

Fifteen varieties of oats were tested. Owing to the very dry weather just when the oats were filling, the yields are lighter this year than usual. The highest yielder this year was Gold Rain, which gave 65 bushels per acre. It matured in 104 days, which is the usual length of time for the earlier varieties, such as Eighty Day and Daubeney. All varieties matured in an average of 104 days, which is 11 days earlier than last year's average. The Eighty Day was the earliest maturing and lightest cropping variety. It yielded only 31 bushels per acre, and matured in 96 days. The second highest yielder was a Danish variety, Gul-Nesgaard. This variety matured in 110 days, which was the longest growing period except that of Lincoln. The two varieties, Gold Rain and Gul-Nesgaard, took the leading positions this year, supplanting last year's leaders, Lincoln and Danish Island. The other varieties about held their respective positions with last year's results.

Four varieties were sown for hay but gave very light yields. The varieties used for this purpose were Swedish Select, Banner, Ligowo and Daubeney. They yielded according to the order named, which was a repetition of their performance last year.

Swedish Select. .	1 ton	1,120	pounds	per	acre.
Ligowo.	1 ton	1,000	"	"	"
Banner.	1 ton	880	"	"	"
Daubeney.	1 ton	460	"	"	"

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.		Date of Ripening.		Number of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
							In.		In.	Lb.	Bush.	Lb.	Lb.
1	Gold Rain.	Apr.	22	Aug.	4	104	41	9	10	2,220	65	10	40·8
2	Danish Gul-Nesgaard . .	"	22	"	10	110	46	10	8	2,040	60	00	38·5
3	Twentieth Century.	"	22	"	4	104	42	10	10	1,980	58	8	37·0
4	Abundance Garton's Regen.	"	22	"	3	103	46	10	10	1,920	56	16	39·0
5	Lincoln.	"	22	"	11	111	46	10	9	1,860	54	24	38·8
6	Banner	"	22	"	6	106	44	9	10	1,860	54	24	37·5
7	Irish Victor.	"	22	"	4	104	40	9	9	1,800	52	32	35·8
8	White Wave.	"	22	"	10	110	44	9	8	1,740	51	6	38·0
9	Ligowo	"	22	"	3	103	42	10	9	1,740	51	6	37·4
10	Danish Island.	"	22	"	5	105	42	9	8	1,680	49	14	37·2
11	Victory	"	22	"	5	105	44	8	8	1,680	49	14	38·3
12	Swedish Select.	"	22	"	5	105	42	10	10	1,620	47	22	38·5
13	Siberian.	"	22	"	4	104	44	10	9	1,380	40	20	36·8
14	Daubeney.	"	22	July	28	97	37	9	7	1,260	37	2	36·2
15	Eighty Day	"	22	"	27	96	36	8	7	1,080	31	26	34·6

AGASSIZ.

BARLEY.

TWO-ROW BARLEY.

Six varieties of two-row barley were tested this year, of which the Danish Chevalier was the highest yielder. Beaver was the next highest, and both varieties took the longest period to mature, namely 103 days.

SIX-ROW BARLEY.

Eight varieties of six-row barley were tested. This season most of the six-row varieties outyielded the two-row sorts. This is not always the case at this farm. The varieties Trooper and Odessa headed the list this season, each yielding 46 bushels per acre. All varieties of barley gave higher yields and better quality of seed than they did last year.

Following is the table giving particulars regarding yield, etc.

BARLEY—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, Including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
					In.		In.	Lb.	Bush.	Lb.	Lb.
	Two-Row—										
1	Danish Chevalier.....	April 22..	Aug. 4	104	42	9	4·0	2,160	45	00	53·1
2	Beaver	" 22	" 4 .	104	41	7	3·0	2,100	43	36	54·0
3	Gold	" 22.	July 30..	99	46	8	2·5	1,980	41	12	54·4
4	Swedish Chevalier ...	" 22	Aug. 3..	103	45	8	4·0	1,920	40	00	53·6
5	Canadian Thorpe ...	" 22..	" 1..	101	43	10	3·5	1,860	38	36	53·2
6	Invincible...........	" 22..	" 3..	103	46	9	4·0	1,740	36	12	52·0
	Six-Row—										
1	Trooper	April 22..	July 31..	100	38	9	3·0	2,220	46	12	52·4
2	Odessa	" 22.	" 25..	94	40	9	2·5	2,220	46	12	50·8
3	Mansfield.........	" 22..	" 28..	97	44	10	4·0	2,100	43	36	49·4
4	O. A. C. No. 21.....	" 22..	" 27..	96	40	10	3·0	2,040	42	24	45·3
5	Oderbruch...........	" 22..	" 24..	93	42	10	3·0	2,040	42	24	50·0
6	Danish Tystoffe Prentice........	" 22..	Aug. 4..	104	44	9	3·0	2,040	42	24	53·0
7	Manchurian	" 22..	July 27..	96	40	8	3·0	1,860	38	36	44·4
8	Success..............	" 22..	" 20..	89	38	9	2·5	1,320	27	24	43·5

PEAS.

Nine varieties of peas were tested. They were sown on April 18 and matured between August 3 and August 10, a period varying from 107 to 114 days. The straw was shorter than usual this year, but the crop of grain was up to the average.

The highest yielder was Solo, giving 53 bushels (3,184 pounds) per acre; next in order of yield was Golden Vine with 50 bushels (3,000 pounds) per acre; and the third was Prussian Blue, yielding 46 bushels (2,760 pounds) per acre.

One variety of vetch was grown. This was procured in Sweden and is called Improved Swedish Vetch. It made an excellent growth but the seed ripened unevenly and some was lost in harvesting. The yield was 19 bushels (1,140 pounds) per acre.

PEAS—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.	
						Inches.	Inches.	Lb.	Bush.	Lb.
1	Solo	Medium	April 18.	Aug. 4	108	45	3·0	3,184	53	4
2	Golden Vine	Small	" 18	" 3	107	45	2·5	3,000	50	00
3	Prussian Blue	Medium	" 18	" 5	109	48	2·5	2,760	46	00
4	English Grey	"	" 18	" 8	112	48	3·0	2,700	45	00
5	Prince	"	" 18	" 10	114	46	3·0	2,700	45	00
6	Picton	"	" 18	" 6	110	50	3·0	2,640	44	00
7	Paragon	Large	" 18	" 10	114	46	3·0	2,640	44	00
8	Arthur Selected	Medium	" 18	" 3	107	45	3·0	2,580	43	00
9	Chancellor	Small	" 18	" 3	107	44	2·0	2,220	37	00

EXPERIMENTAL STATION, SIDNEY, B.C,

SAMUEL SPENCER, FOREMAN MANAGER.

CEREALS.

Five varieties of winter wheat, three of winter rye, three of spring wheat, three of oats and two of barley were tested on plots of 1/22 of an acre each, the crops being the first grown on new land. Some plots had been heavily graded and a very thin layer of soil left on the clay sub-soil. All the plots were sown on October 27, and were ripe July 22.

Fall Wheat and Fall Rye—Test of Varieties.

No.	Variety.	Soil.	Weight of Straw per acre.	Yield of Grain per acre.	Weight of measured bus. after cleaning.
			Lb.	Bush.	Lb.
	Fall Wheat.				
1	Tasmania Red....	Black Loam	6,842	46·5	63 0
2	Egyptian Amber.....	" "	7,590	43·0	63·5
3	Buda Pesth	" "	6,050	38·7	64·0
4	Dawson's Golden Chaff	" "	4,356	30·5	63·0
5	Turkey Red ..	Thin black loam on clay sub-soil.	4,620	20·0	63 0
	Fall Rye.				
1	Mammoth White	Black Loam	7,320	36·5	57·0
2	Dominion	" "	4,906	32·5	60·0
3	Thousandfold	Thin black loam on clay sub-soil	6,820	28·0	60 0

Spring Wheat, Oats and Barley—Test of Varieties.

No.	Variety.	Soil.	Date of Ripening.	Days Maturing.	Weight of Straw per acre.	Yield of Grain per acre.	Weight of measured bushel after cleaning.
					Lb.	Bush.	Lb.
	Spring Wheat.						
1	Huron	Black Loam	Aug. 7...	101	3,750	35·0	61·0
2	Marquis..	Thin black loam on clay sub-soil	" 7...	101	2,700	27·5	59·0
3	Red Fife	" "	" 7...	101	3,200	27·5	58 0
	Oats.						
1	Victory	Black Loam..	July 29...	97	6,800	68 0	42·0
2	Banner	" "	Aug. 5...	99	6,710	66·0	42·2
3	Daubeney	" "	July 22...	85	6,710	60·7	42·0
	Barley.						
1	Manchurian (6 row)	Black Loam..	July 22...	85	....	30·0	50·0
2	Canadian Thorpe (2 row).	Thin black loam on clay sub-soil	" 30...	93	....	23·7	53 0

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF BOTANY

FOR THE

Fiscal Year Ending March 31, 1915

PREPARED BY

The Dominion Botanist - H. T. Güssow.

REPORT OF THE DIVISION OF BOTANY

H. T. GÜSSOW, DOMINION BOTANIST.

OTTAWA, March 31, 1915.

The Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the sixth annual report of the work carried on by the staff of the Division of Botany.

The year's work was greatly increased through special attention being paid to the administration of the Destructive Insect and Pest Act.

The Field Laboratory of St. Catharines, Ont., now established long enough to show the first results, is proving a real benefit to that district. In charge of Mr. W. A. McCubbin, M.A., a very able and enthusiastic colleague, the work is being highly appreciated by the many who have availed themselves of the advantages of the information and demonstration afforded.

The field station occupies a very useful part in the educational work from both the advisory and the practical demonstration points of view. In numerous instances, farmers and fruit growers who sought advice could be visited from such field stations and their problems be studied on the spot, which is always far more satisfactory than by correspondence, often enough the only alternative means of giving advice.

Field laboratories are not only the most satisfactory means of assisting the public, but are the principal means by which work of so highly scientific a character as that of plant pathology can be rendered useful.

Considerable attention was paid to the investigation and study of potato diseases, with a view to finding measures for their control which would not interfere too much with ordinary farm practice. The most important fact, so far as the control of potato diseases is concerned, is that farmers always appear very confident of "never planting diseased potatoes," whereas it is our experience that this is still far too frequently done, and the sooner this is realized the better. Farmers are warned that the care which at present they believe they exercise is by no means sufficient.

It is our duty and desire to render the work of this Division of the most useful nature possible. It should be remembered that we are working only for the benefit of the farming public. We have generally found that personal instructions, when paying visits to certain farming localities, prove of great value. Visits of farmers to our laboratories are always welcome, and, when we have had the pleasure of having them with us at Ottawa, they generally become valued correspondents and co-operators.

For convenience sake, this report is divided as usual into several sections, viz.: 1. Destructive Insect and Pest Act; 2. Plant Pathology; 3. Economic Botany; 4. Report from Branch Laboratory at St. Catharines, Ont.; 5. General.

1. ADMINISTRATION OF THE DESTRUCTIVE INSECT AND PEST ACT.

In last year's report we recorded the fact that the United States Government had placed an embargo on all countries, including the Dominion of Canada, where the disease "Powdery Scab" existed.

Raising of the embargo.—During the latter half of the month of June, the Dominion Botanist conferred with officials of the United States Department of Agriculture with a view to securing the raising of the embargo on potatoes. Arrangements were made by which potatoes would be allowed entry into the United States, until such time as potatoes affected with powdery scab should be found in any consignment from Canada.

Considerable time was spent in the preparation of the necessary regulations to carry on inspection and certification of all potatoes from the infected countries. A number of inspectors were appointed, who received special training at the Central Laboratory until they were found to possess the necessary knowledge requisite for the carrying out of the regulations.

The inspection of potatoes commenced in December, 1914, in the Province of New Brunswick and was directed from Ottawa. Mr. Rolf Holmden was placed in charge of the inspectors, and he has administered the regulations in as satisfactory a manner as could possibly be done. To Mr. Holmden's efforts is largely due the success of the work as far as could be expected from the regulations in force, which, it must be understood, were essential to the raising of the embargo.

The following is an account of the work carried on during the year under the Destructive Insect and Pest Act appropriation.

Field and cellar inspections of potatoes in 1914.—In order to secure accurate data of the distribution of powdery scab, a number of inspectors were instructed to make a careful survey of the potato-producing regions of Ontario. It is interesting to note that, although no doubt a fair quantity of seed potatoes used in the Province of Ontario came from New Brunswick and the United States, where powdery scab is known to exist, no indication whatever has been found that powdery scab is established in Ontario.

In Ottawa, where we have carried on a series of experiments with powdery scab under field conditions, we have not secured any results; no powdery scab made its appearance during two years of experiments. It is not possible at present to explain this curious result.

Field inspection.—During the summer months, inspection of field crops was carried on in the Maritime provinces. The object of this inspection is to keep a check on places where the disease has previously been found, and to ascertain whether farmers follow the instructions given to them concerning the prevention of this disease, and with what success.

It is gratifying to be able to report a marked improvement in this direction. No new outbreaks of disease had occurred on any of the farms visited, the farmers having followed the instructions left by the inspectors the previous year.

Since the inspection in 1912-13 of the farms of Prince Edward Island, we have been able to learn an instructive lesson. Fifty-one cases of powdery scab were located on as many different farms. On revisiting these farms in 1914, it was found that only four farmers had followed the instructions given to all of them. Of the four who had followed instructions, three had no disease on their farms, while one had evidently planted infected seed without being aware of it. This will plainly show, that, where the instructions are being followed, powdery scab is unlikely to reappear, and it also shows that it is not a difficult disease to prevent if farmers will only follow advice.

In fully 80 per cent of the instances where powdery scab has been located, the farmers have declared positively that there has been no change of seed or introduction of new strains for ten, fifteen, or even twenty years, and they were positive that powdery scab had affected their tubers for years.

OTTAWA.

One possible source of infection may be traced to the use by farmers of bags furnished them by the potato shipper, and previously used for handling potatoes. It is one of the practices of the trade to procure old bags from second-hand bag brokers, regardless of the use to which these bags might previously have been put, when shipping to order consignments of potatoes in bags; another custom is to have an equivalent number of bags returned them by the consignee. These bags are not infrequently distributed to farmers and potato growers for bagging potatoes in their cellars or potato houses. It is, therefore, not improbable that at some time or other these bags or sacks may have contained infected tubers, become contaminated with the spores, and thus become the means of carrying infection.

There can be no doubt of the part played by potato planters and diggers as disease-carrying agents. Instances where disease has evidently been carried from farm to farm by the joint use of such implements are common enough.

Railway cars used for the transportation of potatoes, which have been insufficiently cleansed and disinfected before being again used for potatoes, are another possible source of contamination.

The prevalence of minor potato diseases, other than powdery scab, in field crops was very noticeable, and the use and value of seed treatment and spraying were constantly emphasized. Such diseases as Early Blight, Late Blight, and Rhizoctonia were frequently in evidence; and in many sections of New Brunswick and Prince Edward Island, Black Leg and Leaf Roll were observed.

Potato storage conditions very imperfect.—The indifference to the proper storage of potatoes was a feature that was constantly brought before the inspectors. Very few farmers seem to appreciate the value of a well-ventilated, cool, dry potato cellar. As a general rule, they store this crop in cellars beneath the farmhouse; these cellars are not infrequently without floor other than the original soil, and are often without any other walls than the mud sides, or, where there are constructed walls, these are of stone, and in the cold of winter are continually damp. In many instances, the cellars are so poorly drained, that water lies in puddles on the floor after heavy rains in the spring or fall; it is the rule more frequently than the exception to find no provision whatever made for ventilation, with a resulting damp, unhealthy atmosphere, the temperature of these cellars frequently standing at 60° F., conditions totally unsuited to the successful storing of potatoes, and decidedly undesirable, from a sanitary point of view, for the occupants of the house above.

It is estimated that the loss from rots, due to these improper methods of storing, is fully 17 per cent (and often much more) of the entire amount stored. These conditions are general in every province visited; wherever they have been found to exist, farmers have been advised to build a potato house, if the size of the crop warranted it, or to divide the cellar into bins, with close board partitions, and raised, open, board floors made of 1 inch boards laid 1 inch apart and raised from four to six inches above the cellar floor. This would allow a certain amount of ventilation, at the same time keeping the potatoes from contact with ground water; ventilators to carry off the foul air, and prevent its rising into the house above, were also recommended.

During the latter half of October, Mr. Adams visited Prince Edward Island, and addressed meetings of farmers at the following places: Montague, Souris, St. Peter's, Tracadie Cross, Murray River, Summerside and Hunter River. Specimens of potatoes were exhibited showing disease and a description was given of the method of attack, the means by which it spreads, and the remedies to be employed in getting rid of it. A considerable number of the coloured folders on potato diseases were distributed.

A conference was also held with the members of the board of trade at Charlottetown, at which the question of the embargo on potatoes was discussed.

OTTAWA.

Potato inspection in New Brunswick.—On November 4, 1914, the regulations of the Destructive Insect and Pest Act then in force, were rescinded and revised rules and regulations respecting destructive insect pests and plant diseases were substituted. Under the new form of the Act, the inspection assumed a wider field of action, with a view to the recovery of the United States market. All potatoes consigned from infected areas to the United States, or to disease-free areas in Canada, became subject to inspection, and could not be released for these markets unless certified free from powdery scab, or diseases similar thereto, by a qualified official of the Dominion Department of Agriculture.

Actual work of inspection under the revised regulations commenced in the province of New Brunswick on December 12, 1914. The inspection staff then in the province consisted of eleven inspectors, but shortly after the New Year this number was augmented by six inspectors from Nova Scotia and Quebec.

The immediate call for inspectors came largely from along the line of the C.P.R. running from McAdam Junction to Edmunston through the counties of York, Victoria and Carleton.

The preliminary work of the inspection service consisted in thoroughly acquainting the shippers with the actual working of the rules and regulations, and getting them to comply with them; slight difficulties were met with in this respect, but on the whole it was found that the shippers were anxious to comply with the law.

Method of handling and loading potatoes.—Along the principal lines running through the larger potato-growing counties of the province, the potato buyers have erected at the sidings potato houses for the storing, racking and loading of potatoes; at the smaller sidings, where the amount of trade does not justify the building of a house, potatoes are loaded direct from the wagons or sleighs to the cars. Potatoes are, as a rule, hauled in bulk to the potato houses, there racked, and all diseased, frozen, decayed, or badly injured stock removed, thus making the stock fit for the market. Before the arrival of the inspectors racking and sorting were done in a very slovenly manner in many of the houses. Where loading was done at the sidings, the racking and sorting took place at the farms. In both instances, the sorting and grading of stock were done in the presence of the inspector.

The inspector's duty was to see that disinfection requirements were carried out thoroughly, that all stock leaving his particular district was free from powdery scab, or diseases similar thereto, and otherwise fit for the markets, and that all "first grade" potatoes were, as the name implies, an A1 stock, and from an absolutely disease free source.

Actual experience in inspecting and certifying potatoes soon revealed certain minor faults in the regulations. It was found that many lots of table potatoes were being shipped out of the province, which, although free from powdery scab, showed considerable injury from the digger, or from rot, or frost, and they were so badly sorted as to often render as much as 30 per cent of them unfit for human consumption. It was immediately seen that the government inspector could not possibly "certify" potatoes in such condition. An amendment was made to the definition of table potatoes with the result that their quality rapidly improved. The shippers soon noticed the effects of more careful attention to the quality of potatoes, so much so that they were asking to have their grading made to apply to all potatoes shipped from New Brunswick anywhere.

This year the condition of potatoes was unusual, since probably 40 to 50 per cent of the potatoes harvested in 1914 in this province were marred by cuts or bruises. This feature was due to the fact, that at digging time the ground was very dry and the digging machines carried up little or no soil with the potatoes, when elevating over the carriers. The result of the loss of this protecting soil was, that the potatoes were exposed to the harsh surface of the elevator and in many instances were badly injured or cut.

OTTAWA.

Amount of potatoes inspected.—From December 14, 1914, to March 31, 1915, 80,400 bushels of first grade potatoes and 521,000 bushels of table potatoes have been duly inspected and certified. Of these 53 cars containing 41,123 bushels were shipped to the United States. The United States inspectors then found one car of Canadian potatoes to contain infected tubers with the result that all permits to import potatoes into the United States were cancelled.

Lessons from the inspection.—Notwithstanding careful training and devoted attention to the duties of inspection, it is humanly impossible for any inspector to certify and pass potatoes without allowing an occasional infected potato to pass through. The responsibility rested almost entirely with the inspector, whereas, in our opinion, it is most important that the farmer do his share of the work, and the shipper the rest. The regulations called for the inspection of farmers' crops, which was carried on as far as possible, but, when the shipping became more rapid, the inspectors had to frequently inspect and rack the potatoes, while a car was being loaded.

Furthermore, the fact that the regulations permitted the shipping of uninspected potatoes within the diseased area, resulted directly in the propagation of the disease, which it was considered important to control. The farmers would regard the inspection as a farce, because they could sell all their potatoes, irrespective of disease or inferior quality, to the shipper who shipped *within* the diseased area, whereas they immediately had to permit the racking and sorting of their potatoes with naturally a loss to themselves, when they dealt with shippers shipping *outside* the province.

2. PLANT PATHOLOGY.

Every day of the year there were received a number of diseased plant specimens for identification and suggestions for treatment. In a great many instances, the diseases are very common ones and need little attention beyond the giving of the advice sought. In others, the investigation requires several weeks or even months before its definite cause is recognized. In such cases, however, advice may often be given at once, as the general mode of spread and distribution is about the same in a good many diseases, but it is most important to carry on a study of any new or little known disease in order to discover its proper treatment. In nearly five hundred instances advice was given concerning the control of specific diseases as shown by the specimens received.

We may point out that it is very desirable to send samples of seed potatoes to this laboratory for examination before using them for seed. Commencing with sound seed is one of the most important factors in growing disease-free potato crops. We have occasionally found that firms of considerable reputation sell to farmers a class of potatoes for seed purposes which are worse than useless, often harbouring diseases which are most undesirable on any farmer's land. At the present time farmers have no protection when buying their seed potatoes.

The Division's Farmers' Circular No. 4, showing in natural colours a number of potato diseases conveyed by the use of unsound tubers, has been found a very useful publication. This has brought us many complimentary letters and requests for copies from nearly all over the world, some governmental departments considering this method of instruction one of the most useful ever brought to their attention.

Special attention is being paid by the members of the Division to the study and control of potato diseases. We are calling the attention of the growers of this important crop to several diseases in this report, and hope that a thorough knowledge of the potato diseases together with a co-operative effort towards their control will eventually stamp out the more widely prevalent ones. At the present moment very considerable damage is done by the many diseases affecting the potato plant. In some instances we have observed losses amounting from 25 per cent to 50 per cent of the total yield.

OTTAWA.

DISEASES OF POTATOES.

Common scab.—In order to test the effect of fresh manures of various kinds on the production of common scab, six plots were planted after manuring as follows:—

A. No Manure;
B. Fresh pig manure with straw;
C. Fresh cow manure with sawdust;
D. Fresh horse manure with straw;
E. Fresh sheep manure with straw;
F. Fresh hen manure with straw.

The variety used was Irish Cobbler, and the potatoes were free from scab when planted. The land had not been previously planted with potatoes, but had borne a crop of turnips the previous year. After the potatoes were raised, they were washed and divided into four groups as follows: No. 1. Free from scab; No. 2. Slightly scabby; No. 3, Moderately scabby; No. 4. Badly attacked by scab. The percentages of these four groups in each plot were as follows:—

	No. 1	No. 2	No. 3	No. 4
No manure	75·1	20·6	2·9	1·4
Pig	72·5	22·5	3·5	1·5
Cow	75·7	19·4	3·6	1·3
Horse	67·7	26·0	4·6	1·7
Sheep	81·5	15·8	1·8	0·9
Hen	85·8	12·8	1·0	0·4

From this, it appears that fresh horse manure increased the amount of scab considerably more than did any others of the manures used, while the largest amount of clean potatoes occurred where sheep and hen manure were used.

Powdery scab.—A large number of experiments on methods of control of this disease were carried out during the year and interesting results were obtained. It has not been deemed advisable to publish these results until another series of experiments have been carried out during the summer of 1915. An exactly similar set of experiments has been planned for the Central Experimental Farm and four of the Branch Farms in Quebec and the Maritime Provinces, and it is hoped the results throughout will be of a uniform character.

*Net necrosis.**—When a potato tuber is cut across, there may be seen a large number of very small spots or areas of a yellowish colour, the rest of the flesh of the potato being of a much whiter hue. These yellowish areas are the "vascular bundles" which correspond in the potato tuber to the veins of a leaf.

During the year a considerable number of potatoes were found on being cut to have brownish internal discolourations which at first are arranged in the form of a ring, but later on become quite irregular in their distribution. These discolourations correspond to the vascular bundles mentioned above.

The disease (if it can be called a disease) begins at the stem end and gradually travels along the vascular bundles towards the eye-end, turning them brown as it proceeds. No fungus or bacterium has been found as the cause of the disease, and it is not communicated from one tuber to another by contact during storage so far as we know at present. It is of wide occurrence, having been reported during the year from New Brunswick and British Columbia. It has been suggested that "net necrosis" is an indication that the variety in which it occurs shows symptoms of deterioration, but as yet there does not seem to be sufficient proof for this statement.

* See illustration Annual Report of Dominion Botanist for the Year 1911, pl. 9, fig. B, and Farmers' Circular No. 4, fig. 3.

OTTAWA.

Some experiments were undertaken during the year to determine whether tubers that showed "net necrosis" before planting would produce a crop free from the disease, but this hope was not realized, it being found that the disease in almost every case was hereditary. Further experiments will be carried on during next season, but the only remedy that can be suggested at present is to discard all potatoes that show the brownish discolourations when cut at the stem end, and to use only perfectly sound tubers as sets.

Silver scurf.—Specimens were received during the year from British Columbia badly affected with this disease, so that its occurrence would not seem to be general throughout the Dominion. In the United States, it has recently been found as far west as the State of Utah.

Some experiments were undertaken to test the effect of fungicides in preventing the appearance of this disease, when sets that showed silver scurf were planted. Formalin, copper sulphate, corrosive sublimate, hydrogen peroxide and sulphur were used, but, as the experiments were of a preliminary nature, only small quantities of tubers were used in each case. It would be unsafe to draw any general conclusions from the results obtained, but they look promising and will serve as a basis for a much more extended series of observations next season.

Rhizoctonia or black scurf of potatoes.—(*Corticium vagum solani*, Burt)—(Plate 1).—This disease has been mentioned and illustrated in previous reports, but recent knowledge of the presence of the causal fungus in the interior of the stems of the potato plant makes it of greater importance than was previously suspected. The familiar black, scurfy outgrowths on the surface of potatoes are the "sclerotia," which constitute a resting stage of the fungus. When tubers showing these sclerotia are planted, the fungus develops, as the potato plant grows, and infects the young shoots, forming brown scars or lesions on them (Fig. C). These may at times completely girdle the stem at about the ground level, and so cut off the food supply going to the leaves as well as that going to the roots for the growth of the new tubers. This disturbance often results in the production of small tubers in the axils of the leaves, as shown in Fig. A, Plate 1; or, when tubers are produced below ground, they are not usually of a marketable size.

The sclerotia previously mentioned have also been found to occur on the roots, as shown in Fig. B. In this way a field producing an infected crop would itself be infected on account of these sclerotia being left in the soil.

Our present knowledge of this disease confines us to two lines of treatment, viz.:—

1. Soaking the tubers for three hours in a solution of bichloride of mercury, one ounce in 12½ gallons of water, so killing the sclerotia on the seed potatoes.
2. A strict rotation, in which potatoes would be grown only once in every four or five years in each field, so that those sclerotia left in the field on the roots of infected plants may not be able to infect another crop, which they would do, if potatoes were planted in that field during the few years following the infected crop.

We are now treating generally all our seed potatoes in the way recommended above, and have succeeded—even on a large scale—in reducing the losses from Rhizoctonia considerably. Indeed in some years the potatoes raised on the farm from properly treated seed were almost perfectly clean.

Although at times a potato plant may show plain symptoms of Rhizoctonia infections above ground, viz.:—a curling of the leaves, which are also often lighter green to yellowish in colour—there may be no effect visible below ground beyond a few insignificant stem lesions. But in our experience the tubers produced from a plant of this description are of inferior strain and likely to produce diminished crops when used for seed. For this reason we practice careful removal of affected plants in the field in order to prevent any decrease of future yield.

OTTAWA.

DISEASES DECREASING THE YIELD OF POTATOES.

A potato disease affecting the potato tuber and readily recognizable as a disease, as, for instance, Common Scab, Powdery Scab, Dry Rot, Late Blight, Net Necrosis, Fusarium Wilt, or Silver Scurf, is not considered as dangerous as are a number of diseases which reduce the yield, but show no signs whatever on the "seed tuber." The former may easily be removed when selection of seed tubers is practised, or when cutting the sets for seed. The most important factor for the elimination of diseases of the latter group is the inspection of the growing plants and the systematic removal of all plants showing any of the symptoms of mosaic leaf, leaf roll, curly dwarf, Rhizoctonia, or black leg. Where this method is practised, the crop will be reasonably free from diseases, providing, of course, that late blight is prevented by the usual sprayings.

Black-leg of potatoes (Plate 2).—The accompanying plate illustrates the chief features of the "group" of potato diseases popularly referred to as "black-leg." Several bacterial organisms have been described, of which probably Dr. Harrison's species *Bacillus solanisaprus* and Dr. Appel's *B. phytophthorus* are the most common in Canada, if indeed the slight diagnostic differences between the two justify their separation into two species.

The potato "black-leg" disease has been observed practically in all regions of the Dominion where potatoes are being grown. It often causes considerable losses. In one instance of about 300 plants in a row, some 100 had been destroyed by this disease. The proportions were the same all over that particular field, and the loss amounted to practically 33 per cent of the yield.

Appearance of black leg.—Where infected potatoes have been planted, without due precautions, the field will invariably show a considerable number of "misses," resulting from the failure of the planted sets to grow. When digging up the planted set, it is usually a decayed, putrid, rotten tuber, or portion thereof, that is found. The black-leg germ has consumed the set entirely and prevented it from making a growth.

On examining the other plants in such field more closely, we will discover a number that are below the size of the normal plant; they are also yellowish green in colour, and their leaves are curled up, giving the single shoot a compressed appearance. In order to make quite sure of this appearance being due to black-leg, catch hold of one or more vines, pull them up, and look at the portion that came from underneath the ground. If this is black from below ground to about 3 inches to 4 inches up the stem, and either dried up, or slimy and moist, this is one more factor proving it to be black-leg disease. Fig. (b) of our plate shows a young sprout with a typical black "leg."

Fig. (a) shows a whole plant affected with black leg. The shoot in the centre is wholly killed; the other two are affected to some extent above ground and, their base being destroyed, the shoot tumbles on its side, the leaves will curl up and fade, and eventually the whole plant will die.

"*Leaf-roll*" *disease of potatoes* (Plate 3).—The importance of removing all hills in a potato field showing any symptom of disease, and thus eliminating all risks of harvesting a diseased strain of potatoes, is emphasized in the case of leaf-roll of potatoes. This disease cannot be detected by an examination of the seed potato, hence, if such are taken from a crop infected by this disease, they are likely to be planted without hesitation, and the result will be a very serious decrease in yield. It is, therefore, important for every farmer to become acquainted with the symptoms of this potato trouble to avoid serious losses in future crops.

The figures of plate 3 will plainly show what a typical hill affected with "leaf-roll" will look like in the field. The normal potato foliage shows the leaves well expanded and fairly flat; perhaps the young undeveloped leaves may show a degree of folding, which, however, is quite normal; but, when a number of plants are found, which are dwarfed and have all their leaves peculiarly rolled up, as plainly shown

in figure (b) of our plate, we have little doubt that a case of typical leaf-roll is under examination. These plants often bear a foliage slightly discoloured, at times of a lighter green, at others of a yellowish tint, or still again rather tending towards a purplish hue.

These symptoms are noticeable at a very early stage of growth and, if such a plant is watched, it will rarely be found to recover its normal appearance. On digging up a plant of this kind, we may find a number of apparently perfect tubers, indeed we have sometimes found an almost normal yield below ground; this is rather an unfortunate condition, for the tubers resulting from such plant contain the disease without showing any signs whatsoever, and are likely to be planted by the unsuspecting farmer.

If such a tuber is planted, the result will be a plant like that shown in fig. (c). This bears not a single marketable potato. At the bottom of the picture, there is shown the sound mother tuber, a few clustered tubers at the base of the stem and the thickened white stolons with small tubers attached, which will never grow to any size.

We have observed a field of potatoes recently which showed some 80 per cent of leaf-roll diseased plants, all of which bore some marketable tubers. If the farmer should plant one acre with these tubers, it would not be worth his while to harvest the crop. It has been shown repeatedly that the leaf-roll disease is transmissible, and that potatoes from a diseased plant will give little or no yield.

In order to avoid such losses, it is most advisable not to use for seed *any* of the tubers harvested from a field showing more than 5 per cent of affected plants. This may seem severe, but we must bear in mind that, though such crop still shows 95 per cent apparently of sound plants, there is a strong probability that a large proportion of these plants may turn out to be tubers, which, when planted, will grow up into diseased plants.

Where five and less per cent of affected plants occur, they should be removed immediately to prevent the harvesting of diseased tubers.

We consider this disease sufficiently serious to warrant the attention of all potato growers, particularly those growing seed potatoes.

Great care should be taken by potato growing centres in the eastern section of Canada to stamp out this disease; should this warning be disregarded, it may result in serious losses in the trade of seed potatoes.

The cause of leaf-roll is not known. For years the study of the cause has engaged the most experienced potato disease specialists, but no satisfactory solution has yet been reached. It is looked upon as a physiological trouble rather than a parasitic one; it neither spreads in the field from one plant to another, but is exclusively conveyed by using seed potatoes from a diseased crop, nor does it appear to infest the soil.

The term "leaf curl" or "curly dwarf" is often used in describing an appearance probably related to leaf roll, viz.: When the foliage of potato plants curls up very much, presenting an appearance similar to currant leaves, puckered, curled and clustered through aphid attacks. Sometimes the "curling" is so pronounced as to resemble "Scotch or Curly Kale." Such plants are of dwarfish habit and of so characteristic an appearance, that it is difficult not to recognize a typical case.

Mosaic disease of potatoes.—One of the most obscure maladies of certain solanaceous plants, to which group the potato, tomato, and tobacco belong, is the trouble popularly known as "*Mosaic Leaf Disease.*" This has for some years attracted the attention of plant pathologists in Europe and America. Nothing very definite is known of its nature, but since it has proved considerably injurious in tobacco and tomato plants, it is advisable to call attention to its occurrence on the potato.

We have no original contribution to make, at present, to what is already known about this trouble, since it has only come under our observation in Canada for two seasons. We are, however, making a careful study as opportunity affords. At present only a description of its symptoms is being given to enable students and others interested to recognize it.

OTTAWA.

Mosaic leaf disease is not recognizable on examining a potato tuber. In tobacco the disease is not considered hereditary. In the tomato this point is still subject to some controversy. In the potato, a plant almost exclusively propagated vegetatively, through its tubers, the disease is, according to our observation, transmitted through tubers harvested from a plant showing symptoms of Mosaic. Some observers record that it is spread by contact, by alternately touching diseased and healthy plants. It is considered an infectious disease. At present we cannot confirm these reports. One fact, however, is worthy of record as far as our observation is concerned. The sound leaf of plants is a complicated "plant" for the manufacture of food. Any impairment in its construction, or deviation from its normal functions, the former of which is recognizable by microscopical examination, whilst the latter is a deduction from such observation, naturally reduces the activity of the leaves as manufacturers of food; hence the potato underground must suffer according to the intensity of the trouble present. This is the actual case. Mosaic disease-infected plants do not consecutively yield normal crops. For this reason, it is advisable to pay heed to its presence and avoid the use for seed of tubers produced by an infected crop.

The following is a description of the disease as we have observed it:—

Mosaic leaf disease manifests itself by producing in the leaves a mottled appearance, which is more or less readily visible. The mottling is due to irregular patches of lighter green to yellowish areas appearing all over the leaf. This discoloration is not very clear in sun light, but, when holding in the shade a leaf of a plant which is suspected of Mosaic disease, and comparing it with that from a sound plant, it will show up the mottled appearance much more strongly.

The lighter coloured areas, which by no means give one the idea of a "sick" leaf, are slightly thinner than the normal portions of the same leaf. The difference is often so slight as to be perceptible only after microscopic measuring. The leaf may also be puckered, particularly when the disease is in an advanced stage. In the variety "Red Bliss" we have seen the disease worst, but other varieties, like "Cobbler," and "Green Mountain," have also been observed to be infected. Accompanying these symptoms, from which the disease has obtained its name, there may be observed a curious rosette shape formed by the younger leaves. The affected plants are often of normal size, and bear a normal crop, when observed for the first time.

In plants grown from a potato taken from a typical mosaic leaf plant, the leaves show the mottling very plainly, they do not grow very vigorously at first, but may later pick up somewhat in vigour, and yet produce some few good-sized tubers. It is generally after a few years that a decline in yield is observed. There are no constant symptoms visible externally on any other part of the plant.

When potatoes are raised for seed purposes, the presence of more than 5 per cent of Mosaic disease should disqualify the field altogether. Though the nature of the disease is so little known, the indications are that it may prove a very objectionable trouble, so that it is advisable to take every possible step to prevent its propagation by affected seed potatoes.

CLOVER AND ALFALFA WILT DISEASE.

Clover and alfalfa are among the most useful fodder plants grown in Canada, and any disease likely to prove destructive to these crops should be speedily recognized and prevented from doing serious damage. Generally speaking, Canada is fairly free from clover diseases. The alfalfa leaf spot, which occasionally may result in severe losses of herbage, occurs now and then, but, though widely prevalent, cannot be said to be a very serious disease.

It is different with the clover and alfalfa wilt, should it become in this country anything like as serious as it has proven itself to be in the old world.

(Photo by F. L. Drayton.)

A. The parts above ground of a potato showing axillary or aerial tubers common in Rhizoctonia disease.
B. Portions of roots showing dark-coloured sclerotia of the fungus.
C. Portion of the stem of potato below ground, showing the dark spots or lesions caused by the fungus.

(Photo through the courtesy of Dr. W. A. Orton, U.S.A. Dep. of Agric.)

A. A potato plant dying from an attack of Black leg.

B. A young potato shoot showing the typical "black-leg" or killed portion of the stem below ground.

C.—F. A number of tubers showing black-leg infections.

(Photo through the courtesy of Dr. W. A Orton, U.S.A. Dep. of Agric.)

Leaf Roll Disease of Potatoes.

A. Two potato plants showing typical rolling up of leaves.
B. This plant shows the leaf roll disease very plainly.
C. Underground portion of a potato plant affected with leaf roll. Note the parent tuber planted, at bottom, which has not been consumed and the few clustered tubers towards the crown. No marketable tubers in this case.

While writing these lines, we have only observed two authentic cases of this disease. One was reported to us from the experimental plots of the Agricultural College at St. Anne's, Que., and the other appeared in a small plot on the Central Experimental Farm. In both cases the damage to the crop was negligible. An examination of clover fields in other sections of the country will be made, and until this has been completed, nothing further can be said about its present distribution.

In the United States, this disease, or one apparently identical from the records, appears to have been known since 1889 when it was first recorded from Delaware. Prof. Stewart of Geneva, N.Y., records a wilt of alfalfa observed in 1899; from his description and plate it appears the same as that under our consideration. The same is the case with a disease on alfalfa recorded by Prof. Jackson of Oregon. It is evident from the existing accounts that the disease has not shown itself very destructive so far in America.

In Europe, particularly in England, clover lays are frequently destroyed in an alarming manner. It is generally held that such land has become "clover sick," by which is meant that it cannot grow any more clover once a clover crop has failed. This condition is considered by the agricultural chemists of that country to be due to some changes "within the range of the root" indicating some chemical deficiency, or change of the soil detrimental to the growth of clover. Even though it has been shown that the trouble is due to a fungus disease, the particular disease mentioned above, the chemical experts still view the matter from the chemical point of view rather than the biological.*

Appearance of clover or alfalfa wilt.—After winter, when these leguminous plants would normally start into growth by sending up fresh new shoots from the underground rootstocks, there may be observed in the field larger or smaller patches which remain bare. It is not infrequently given as an explanation that "the clover on these patches has been winter-killed." It is, however, peculiar that a number of plants in certain small patches only should be killed by the winter, while the rest start vigorously into leaf. In some instances, no doubt, such appearance may be caused by the plants having been killed by frost or ice, particularly when, for some reason or other, the snow covering was insufficient or wholly missing, but a careful examination of the clover plants early in the season will invariably reveal the true cause. We have observed a number of bare patches in our small plot, and being familiar with the appearance of clover wilt, hunted for evidences of same. The plants growing in the neighbourhood of the bare patches were carefully examined and a number of wilting plants were found. These had made (about the middle of May) a growth of some four to five inches and the shoots looked sickly and limp, as they might appear after a severe drought. The leaves had turned a darker green than shown in sound plants, and the bottom leaves were shrivelled, brown in colour, and quite dead. The plants were dug up and examined carefully. From this preliminary examination, we were fairly certain that it was a case of clover wilt. Microscopical examination, while on the whole giving us additional clues, did not absolutely confirm our opinion, inasmuch as the tap root of the clover was found to be attacked by the Clover Root Borer (*Hylastinus obscurus*). Diseased tissue was cut out which showed plenty of mycelium of a fungus and was placed on a nutrient substance. This method resulted in absolute proof of the identify of the disease with our knowledge of clover wilt as causing clover sickness in England. Typical sclerotia developed which were identical with those obtained from the diseased material from St. Anne's, Que.

Farmers are, therefore, requested to look for the "patches" in clover or alfalfa fields and immediately to send in suspicious looking plants showing the symptoms described.

* H. T. Güssow, Clover Sickness and its cause, Journ. Roy. Agric. Soc. of England, Vol. 64 entire series, pp. 376-391.

Cause of clover wilt.—The clover wilt is caused by a microscopic fungus, known to us by the scientific name *Sclerotinia ciborioides*. Other investigators refer to it as *Sclerotinia trifoliorum* but this is a matter of botanical nomenclature. Those who consider the fungus as identical with *Sclerotinia libertiana* Fckl. have no doubt their reasons. In cross inoculations made in this laboratory, we readily produced the typical soft rot caused by *S. libertiana* by using sclerotia of that fungus produced in pure culture for inoculating carrots, while in no case did we succeed in doing this with pure culture material of the fungus isolated from clover. When examining clover or alfalfa plants killed by this disease, the most striking and characteristic feature is the presence of a number of black bodies of a horny substance varying in size from the head of a pin to a wheat grain. These black bodies in clover appear more or less deeply embedded in the tissues of the crown of the root or in the tap root itself. In alfalfa they may also appear inside the split stalk, as well as on the outside of same. The botanists call these bodies *sclerotia* and consider them specially organized masses of fungus mycelium, which serve the purpose of reproducing the same. The clover wilt fungus produces an abundance of mycelium, which penetrates the tissue of the plants and envelopes the crown, stem and leaves with a dense growth. From this growth the *sclerotia* are eventually produced and, when full size, drop to the ground where they hibernate. In spring, these *sclerotia* produce a fruiting stage consisting of one or more stalked cup-shaped receptacles, furnished with a layer of minute spore sacs, bearing reproductive spores. These spores are then shot out of the sacs and germinate on the clover plants, where they continue to grow and finally, towards the end of the season or throughout the season, again produce *sclerotia*.

These *sclerotia* remain alive in the soil, which they closely resemble, for a considerable period. Sometimes such large numbers of *sclerotia* accumulate in the soil as to prevent any clover from growing; this factor has led to the belief of the land having become clover sick. This is not the case, because on removing nine inches of the top soil of a small plot showing all characteristics of "clover sickness" and picking out of it an enormous number of *sclerotia*—and returning the same soil again to the plot, a beautiful even stand of clover was obtained at once.

In agricultural practice, the removal of the *sclerotia* is impossible. Their destruction in the soil is likely to be equally impracticable. This disease again points out the absolute necessity of practising rotation of crops. There are two possible means of eradication: (1) Spraying of clover fields with some fungicide, just as the spraying of potatoes is practised, or (2) the selection and breeding of resistant strains, both of alfalfa and clover.

Much research is still required before more definite information as to the control of this disease can be given. When the disease is noticed in a field, the sooner in spring the dead patches are taken up for a depth of about six inches the better. They should be filled in with new soil and may be resown with clover. The soil removed, which most likely contains a large number of *sclerotia*, should not be conveyed to any place whence it may find its way eventually back to the land and distribute the disease. It might be spread in the centre of a road actively in use by traffic.

OTTAWA.

3. ECONOMIC BOTANY.

A large number of weeds and other plants for identification were received during the year. More than half of these were sent in during the months of July, August and September, but some specimens were received during each month of the year.

The following table shows the number of specimens sent in for examination from each province of the Dominion:—

Nova Scotia	22
New Brunswick	57
Prince Edward Island	156
Quebec	198
Ontario	182
Manitoba	41
Saskatchewan	121
Alberta	112
British Columbia	60

These with a few specimens from unknown localities give a total of 955 reported on during the year.

IDENTIFICATION OF PLANTS.

A number of the above specimens were plants that were suspected of poisoning cattle and horses. In many cases, however, the plant sent was dug up by the farmer from the field where his cattle were grazing and was not a poisonous plant. It may be desirable to point out here that the only satisfactory way of establishing cases of poisoning by plants is to open the stomach of an animal that has died and remove any vegetable matter and soak it in 20 per cent formalin for two hours. This acts as a disinfectant and serves to remove any offensive smell. It should then be taken out of the formalin and allowed to drain for a few minutes, wrapped in a piece of cloth, and sent in a tin box to Ottawa for examination.

As might be expected, a considerable number of plants sent in were weeds of cultivated land and were accompanied by a request for the easiest method of eradicating them. But in addition to weeds, specimens were also received of various native shrubs and trees, and wild fruits, indicating a widespread interest in the native vegetation of Canada. Probably the largest consignments of specimens were from school teachers and were collected in the locality where the school was situated. There is no doubt whatever but that this is a kind of work deserving every encouragement. Instruction of the rising generation in the names and habits of common weeds and native plants generally will not only add to their interest in country life afterwards, but will enable them to carry out farming operations with more success and intelligence.

In this connection a few useful hints on the sending of plants for identification may be useful. Frequently we receive plants which are so dried up and brittle, with the leaves shrivelled or matted together, that they have to be soaked out before examination, and consequently much time is lost. It sometimes happens that the plant reaches us in the form of powdered fragments and is, of course, unrecognizable. Sometimes we receive a few inches of the root only, or a single leaf, or fruit, and we are expected to name the plant from a mere fragment. In some cases this is possible, but as a rule it is very difficult.

1. Wild plants only or weeds should be sent. Garden flowers, cereals, seeds, etc., should be sent to their proper departments.

2. All plants sent for identification should, if possible, be in flower or fruit. The underground parts as well as the lower leaves should in all cases be sent.

3. Fresh specimens can usually be identified much more quickly than dried specimens. They should be sent in a tin box. If a wooden box is employed, the specimens should be wrapped in damp moss or blotting paper.

4. Dried specimens should have the leaves carefully flattened out and should be sent between sheets of stout cardboard. This is necessary to keep them from crumbling to pieces, as they are very brittle when fully dry. Specimens may be dried by laying them between sheets of blotting paper and spreading them out flat, placing a weight on top and changing the paper several times until they are dry. The flowers of dried plants have frequently to be soaked in water, and hence their identification is much more tedious.

5. Each specimen should have a number attached to it and the sender should keep a similarly numbered set for reference. As a general rule, specimens are not returned. Several specimens of each plant should be sent.

6. It will greatly facilitate the work of identification if a short note is added, stating where each species was found growing, whether in a wood, marsh, cultivated ground, etc.

7. Large collections of dried plants should be sent for examination during the winter months. As large numbers of plants, especially weeds, are sent for examination in early summer with a request for methods of eradication, these have to be attended to at once. Large collections, as a rule, have to wait for a more convenient season.

8. The name and full address of the sender should be written clearly on the outside of the package or on a slip placed inside.

9. Letters and packages addressed to the Dominion Botanist, Ottawa, if under 12 ounces, are carried free. There is no limit to the number of packages that may be sent but each must be under 12 ounces.

In addition to specimens being sent up, many requests for information on various subjects were received. A large number of these had reference to the profitable cultivation of medicinal plants. At present, owing to the European war, the price of certain plant drugs is unusually high and some farmers have the idea that larger profits are to be obtained by growing these than can be made from the cultivation of the regular crops. In order to meet these requests for information, a bulletin has been prepared on the subject, and is at present in the press.

Other questions of a miscellaneous nature have been the subject of correspondence during the year, such as the profitable cultivation of hemp in Canada, the growth of the mulberry for silkworms, the culture of wild rice in marshy land, and various other topics.

Seeds were received in exchange from the following Botanic Gardens: Brooklyn, U.S.A.; Siena, Italy; Yurjew, Russia; Sydney, New South Wales, Australia; La Mortola, Ventimiglia, Italy; and the Botanical Gardens, Trinity College, Dublin, Ireland. Seeds were sent out to the following: 37 packets to Sydney, N.S.W., Australia; 70 packets to Manitoba Agricultural College, Winnipeg, Man.; 77 packets to Royal Horticultural Society's Gardens at Wisley, Surrey, England; 15 packets to West Kensington, England; and 16 packets to Royal Botanic Gardens, Glasnevin, Dublin, Ireland.

My assistant Miss Fyles was directed to take charge of the preparation of an exhibit on weeds. For this purpose, sixty-one species of weed seeds, kindly supplied by the Seed Commissioner, Ottawa, were sown May 27 and 28, 1914, in pots and experimental plots at the Central Experimental Farm, for the purpose of studying the early stages of growth of the most common as well as the most harmful weeds in Canada. Specimens of each species were pressed at every important change in the development of the weeds throughout the season. The knowledge of weeds in a young state is highly important to the agriculturist, as it is at this period of growth that they may be most readily and easily controlled.

On July 11, Miss Fyles left for a tour through the West in order to collect flowering specimens of the Western weeds as they are found in their natural surround-

ings. Treesbank, Brandon, Indian Head, Medicine Hat, Lethbridge, Agassiz, Victoria, Lacombe and Rosthern were visited as collecting centres, from which trips were made through the neighbouring districts. Upwards of 800 perfect specimens of weeds representing 44 different species were collected, pressed, dried and shipped to Ottawa, during July and August. Many hundreds of botanical specimens other than weeds were also collected, as opportunity occurred, to be included in the Herbarium. During this trip, it was repeatedly observed that weeds of the worst kinds were allowed to reach maturity on the roadsides and waste places in all directions. This negligence is in a large measure responsible for the constant presence of weeds in cultivated fields.

A demonstration of the life history of 22 different species of Western weeds was prepared for the Central Experimental Farm Western Exhibition circles, each circle showing 14 different species. Each specimen is placed on cotton batting in a shallow cardboard box and covered with glass, which makes a very useful exhibition case.

Exhibition Circular No. 45 was written and 75,000 copies published to accompany this exhibit. The attention of the general public was also drawn to this novel method of mounting weeds by an article in the "Agricultural Gazette."

OTTAWA.

4. REPORT FROM THE FIELD LABORATORY AT ST. CATHARINES

By W. A. McCubbin, M.A., in Charge.

During the year of 1914, the work of this laboratory has been carried on with increasing success, following out the policy laid down at its inception in 1912, which policy embraced three main features: A general oversight of the district to watch for new diseases and to note the progress of those already present; identification of diseases and advice regarding treatment; experimental work on diseases, which are in need of investigation.

The observations and experimental results which follow partially record the work of the year, but much of the work, including several of the more important investigations, is still incomplete, and it is desirable to defer any account of these till they are finished. A number of minor observations and notes on diseases of less general interest are also omitted.

Owing to the frequent dependence of the spread and virulence of diseases on weather conditions, it was decided early in the year to keep a daily weather record which would contain data valuable to the pathologist, such as the maximum and minimum temperature, periods of drought and rainfall, prevailing winds, etc. The records so far kept have proved useful in so many cases that an effort will be made to make these records more complete and comprehensive than has heretofore been possible.

During the year a large number of specimens have been added to the collection of local diseases and a great many photographs have been made of typical specimens of these. From many of these photographs lantern slides have been prepared, and they have also been of use in supplying illustrations for a bulletin on fruit tree diseases begun in 1913 and completed during the present year (Central Experimental Farm, Second Series Bulletin No. 24).

The universal lack of an adequate general knowledge of the nature of diseases and of the fungi which cause them has become more and more apparent, and an effort has been made this year to partially supply the need by giving addresses whenever possible on the "Principles of plant disease." The matter of these addresses was carefully prepared so as to present the subject in a simple manner and use was made of a series of lantern slides specially made up for the purpose. Twenty-two addresses of this nature were given during the winter and the interest shown in them has been so encouraging that they will be continued and extended during the coming year.

IMPORTANT DISEASES DURING THE YEAR 1914.

APPLE.

Irregular apples.—The ordinary occurrence of small, bunched, mis-shapen apples is well known to be due to the attacks of aphis during the early period of growth, and these have been met with quite frequently all over the country. During the recent summer, however, there came under the writer's notice a form of irregularity that differs much from the ordinary sort and seems to be due to an entirely different cause. The apples in this case were confined to two trees (Greening) in the orchard, which was large, well cultivated, sprayed and pruned. Practically all the apples on these trees were affected and the trouble recurred on these trees year after year. The larger apples

were deeply lobed and fissures extended from stem to calyx, so as to almost divide the fruit into several parts. The smaller apples had these lobes less clearly marked, and had more of a lumpy appearance (see Fig. 5, Plate 4). An examination of the internal structure brought out two facts; first, that there were present an abnormal number of seed cavities; and second, a very imperfect union of the calyx with the gynoecium. In some, a cavity between these two parts could be seen, which extended fully half way around the fruit. In this cavity, there often occurred a white proliferation of the fruit tissue, which consisted of stringy or finger-like growths. Many of the seeds were abortive, especially in the smaller fruits, and the seed cavities were for the most part six in number. It is probable that there is here a physiological derangement of the tree rather than any result of the work of a parasite.

CHERRY.

"Blighting" of cherry shoots.—During the month of July, a number of vigorous, young, sweet cherry trees were observed to have numerous short shoots dying along the main stem and larger branches. The leaves on these shoots died suddenly in a manner suggesting Pear blight. It was found on examination, however, that the longitudinal growth of these shoots was not keeping pace with the wood growth of the stem, so that, when they were carried outwards by the radial increase in stem wood, their vascular connection was torn away from the trunk when, of course, they wilted and died.

Shelf fungus on cherry trunk (*Fomes applanatus* (Pers.) Wallr.)—During the summer of 1914, a dying, sweet cherry tree (Elkhorn) near St. Catharines was found to be suffering from an attack of this fungus at the base of the trunk. There were no wounds evident, but it is highly probable that the fungus obtained a footing in a winter-killed area. As will be seen by the plate (Figs. 37, 38), there is a distinct irregularity near the base where the union took place between the bud and the Malaheb stock, and such irregular or imperfect unions are frequently found to be subject to collar rot. At the time of examination, one half the tree was dead and the foliage on the other part was small and sickly. On cutting down the tree, the white strands of the fungus were found in the wood about this region and extending into the roots. A section of the tree was placed on a tub of moist earth and one of the knob-like growths developed later into a typical shelf, which J. H. White of Toronto University kindly identified as *Fomes applanatus* (Pers.) Wallr.

It is noteworthy that several other trees adjacent to this one have become infested, and may be expected to live but a short time, for once the fungus becomes established in the trunk, there is no means of stopping its progress. In this case as well as in a large number of others, where orchard trees are attacked by this and similar shelf fungi, the only thing that can be done is to prevent the fungus from getting a foothold in the tree. Infection takes place either by spores, which are produced by the shelf growth, or by the filamentous growth of the fungus in the soil, principally on bits of wood and vegetable matter contained therein. As the fungus must necessarily enter the tree through a wound or crack of some kind, it is advisable, especially in an orchard where damage from this cause has already taken place, to make as few wounds as possible on the trunk and large roots, or to protect such wounds as are necessary, or unavoidable, by a coat of paint as soon as they are made. It is also bad policy to allow the shelf growths to mature either on the trees or on stumps about the orchard, since the spores produced on the shelf at maturity are a very efficient means of spreading the fungus to other trees.

Trunk injury on cherry.—A striking effect of winter injury on sour cherry trunks is illustrated in Figs. 31, 32, Plate 9. Similar but less pronounced examples of this

trouble have been met with in various parts of Ontario, but, in this particular orchard, the damage was quite marked and about fifty per cent of the trees were affected. The cause of the injury may be stated as follows:—

During the severe winter of 1913-14, the cambial or growing region under the bark of the trunk was so severely injured that the bark and the growing layer beneath it were loosened or separated from the main part of the trunk by the death of the tissue just beneath. Ordinarily, when such an injury occurs, enough of the growing layer still remains alive to continue growth and a new layer of wood is added all over the trunk, so that in the years to come the only indication of the injury to be seen is the browning of the heart wood within the trunk. In the present case, however, another factor appeared, viz., a frost crack on one side of the trunk. This crack allowed the loosened but still living outer tissue under the bark to curl outward from the crack on each side, so that, during the following summer, the growth on this side of the stem formed two leaf-like projecting ridges.

CURRANT.

Drooping of currant canes.—In August, 1912, the writer's attention was called by Mr. H. T. Güssow, the Dominion Botanist, to a field of Wilder currants near St. Catharines, in which a considerable number of the bushes showed a drooping of the canes. (See Fig. 25). This field was kept under observation during the succeeding summer, in order to ascertain, if possible, what factor or factors were concerned in causing this drooping.

On June 11, 1913, when the new growth was 6-10 inches long, a large number of the canes were seen to be wilting. (Plate 8, Figs. 26, 27.) In every case there was evident at the bend a blackened area which was usually in the cortex, but sometimes the cells of the pith were affected as well. The bend was not at the soft growing end of the shoot, as might be expected if it were due to lack of water, but occurred about two inches from the base of the new growth. It was suspected at the time that the darkened areas might be due to some parasite, so cultures of the darkened tissue were made under careful antiseptic conditions. Five test-tubes of potato agar were inoculated with this tissue and two poured plates made of the same material all from different shoots. All remained perfectly sterile. Moreover, sections were cut very thin and examined for fungus filaments or bacteria, but no trace of either could be found in any of the numerous transverse or longitudinal sections made. A comparison of transverse sections from the bend of the shoot with those made from the same shoot higher up, after staining with phloroglucin, showed that while a considerable secondary thickening had taken place in the latter, the wood cells at the bend had developed little or none. In addition, the actual amount of woody tissue at the bent portion was little more than half that produced in the higher unaffected part of the shoot.

The later behaviour of these shoots was followed throughout the growing season, and it was found that some of them, about 1 per cent, withered and died, without, however, showing evidence at any time of the presence of parasitic organisms. Those which survived went on growing throughout the summer, the end drooped under geotropic stimulus turning upwards again, so that the final appearance of the affected shoot resembled the letter "S" turned on its side. Fig. 28, Plate 8, is a photograph of this condition at the end of the summer, and it will be noted that in the upper figure the growth of the previous year also shows the same drooping.

Associated with this wilt of the canes, there occurred a striking chlorotic condition of the leaves shown in Fig. 29. This chlorosis, as may be seen from the photographs, occurs in patches, but with a strong tendency to follow the veins. It appeared very early on the leaves and was very prominent at the time the leaves first reached

their full expansion. After that no further development took place, and these leaves remained otherwise normal throughout the summer except that a few of those low on the shoots fell early. The chlorotic condition mentioned occurred on a few upright shoots, but was mostly confined to those which had wilted in the manner just described. Bushes on which wilting did not occur had little or none of it.

Less than one-quarter of the bushes in this field were affected, and on the worst cases the trouble appeared year after year. It was quite bad in 1913, and a number of bushes, which had not been previously affected, showed this year pronounced wilting, and the accompanying chlorotic condition of the leaves. Those plants which are subject to the trouble are clearly less vigorous than others which are free, but aside from this feature and the consequent lessening of the crop, no other functional derangements were observed.

During the fall of 1913, a number of the wilted canes were again examined, and it was found that in nearly every case there existed in the pith at the bend, several brown, dead areas of varying size, entirely disconnected and unevenly distributed along the shoot. In the wilted canes of the preceding year these brown areas were not observed, and there was now no sign in the wilted shoots of last year of their having been present. The photograph of a wilted cane split longitudinally (Fig. 30, Plate 8) shows a typical specimen where four brown pith masses are to be seen—two large ones and two small ones. There was no external indication at this time of parasitic fungi, nor did microscopic examination of the brown areas show evidence of any organism therein. Eleven test tubes of various nutrient media were inoculated with tissue taken from the centre of these brown masses, each from a different mass. They remained perfectly sterile, however, with one exception, which developed a pink bacterial colony, evidently an impurity from the air.

The probability that no parasitic organism is concerned in this drooping of the young growth is strengthened by the fact that it occurs only on the Wilder variety, and that cuttings from these plants also show the same trouble. The only other cases (two in number) observed by the writer are fields grown from cuttings taken from this affected field. Mr. W. T. Macoun, Dominion Horticulturist, does not remember out of his wide experience with bush fruits, any case of the kind on Wilder currants, though he thinks something like it occurs on the Fay. I am informed, however, by Mr. Richard Wellington of the Minnesota Agricultural Experiment Station that he has several times met with this peculiarity on the Wilder currant, but that no parasite had been connected with it.

The probability is that this is another case of varietal weakness. Whether it can be eliminated from the strains or otherwise controlled will require future experiments to determine.

The Currant Polyporus (Pyropolyporus ribis (Schum.) Murrill).

References:—

Saccardo—Sylloge Fungorum, Vol. 6, p. 184.
Tubeuf & Smith—Diseases of Plants, 1894, p. 452.
Engler & Prantl—Die Natürlichen Pflanzenfamilien I, 1**, p. 161.
Bull. Torrey Bot. Club—30: 118 (1903).
North American Flora—Vol. 9, p. 108 (1908).

The information, that may be gleaned from the above authorities and others concerning this fungus, while valuable from a systematic point of view, is scarcely sufficient for the needs of a practical plant pathologist. Descriptions of the fungus are given by most of these authors; it is recorded as occurring commonly on the genus Ribes, but also on the rose, snowberry and other plants; the suggestion is made that in all probability *P. Lonicerae* Weinm. and *P. Euonymi* Kalchbr. are but forms of this

fungus; and numerous localities are mentioned in both Europe and America where it has been collected.

Little has been recorded concerning the nature and extent of its parasitism or the amount of damage it causes, and no means have been suggested for destroying it or preventing its attacks. The remarks which follow are put forward in the hope that they may add something at least to this neglected side of the subject.

In August 1912, the Dominion Botanist, Mr. H. T. Güssow, called the attention of the writer to a field of currants near St. Catharines, Ont., which was affected by this fungus (Fig. 18, Plate 7) and in the intervals of other work a number of experiments and observations were made during the following year.

The field consisted of about a thousand bushes made up as follows: One row of cherry currants, eleven of currants of the Wilder variety, two more rows of cherry currants, and finally several rows of young gooseberries. On examining the field, two facts stood out conspicuously. First, the Wilder currant was the only variety affected, neither the gooseberries, the black currants, nor the cherry currants being attacked in any degree whatever; and secondly, none of the young Wilder plants suffered, but the trouble was confined to the old bushes of this variety. On making a survey of the old Wilder bushes, it was found that out of 550 plants 170, or approximately 33 per cent, bore growths of the fungus. It is probable that the infection percentage was somewhat larger than this on account of the impossibility of including those plants where only subterranean growth occurred.

The bushes in the affected rows were set out seven years ago, but the disease has only been noticed by the owner during the last three years. Since first observed, it has been getting worse each year. So far as can be ascertained, it is the only case of its kind in the neighbourhood, and it is difficult to account for its introduction unless through infection accidentally brought in from some of the less usual hosts in the neighbourhood. None of the plants in the vicinity likely to bear this parasite showed any signs of the fungus whatever, and the source of the infection remains as yet uncertain. On the chance that it might have been introduced with the nursery stock, the plants were traced and the nurseryman written to. He states that he has never seen the fungus among his plants and is quite sure it is not in his neighbourhood.

According to our observations, the fungus only grows on the currant for a distance of six inches or so above the ground and may also grow on roots in the soil to a depth of four inches. All the evidence at hand seems to indicate that the fungus is a wound parasite only, and gains its entrance by way of stubs left in pruning, wounds made by cultivating tools, or the ends of roots broken by the plough. Its non-occurrence on the young plants, as mentioned by several writers and confirmed by observation here, is no doubt due to the absence of a wound of entry on young unpruned bushes. In the many cases examined, the injury by which entry had been effected could clearly be made out, although it was often necessary to cut the sporophore to pieces to determine this point. Location of the wound was made easy by the fact that the tissues of the fungus invariably radiated from this wound. In only a few cases where sporophores occurred clear of the ground did they conform to the typical shape as given in the descriptions. For the most part they consisted of lumpy masses with little or no poriferous surface (Figs. 22, 24, Plate 7). Where these masses form on broken roots below the soil, they are very diffuse and much mixed with earth. Strands can be traced from these subterranean growths out into the soil on all sides, and the manner in which the fungus masses thus gradually intermingle with the earth suggests that a good deal of nourishment must be obtained from dead vegetable matter in the soil. This indication of saprophytic tendencies becomes significant when the relation of the fungus to its host is further considered.

The condition of the various affected plants shows that, for the field in question at least, the injuries brought about by the fungus are not very severe. Several of the largest and thriftiest plants, of which one case is shown in Fig. 18, Plate 7, bore

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large masses of the fungus about their bases, and these have been present several years without appreciable effect on their host. None of the plants were killed either wholly or in part, and even a general comparison of plants throughout the field failed to reveal any noticeable difference in growth or bearing between those which were affected and those which were free.

As previously mentioned, the fungus is always associated with wounds, and in all of the many cases examined this wound was found to be healing over normally. The callus, though sometimes slightly distorted by the pressure of the tissue of the sporophore, appeared to be healthy, and the dead tissue was not abnormal in amount. It was apparent that in none of these cases could the Polyporus bring about progressive death or cankering of the tissues to its host, but was quite restricted to the dead portions of the wound.

That the fungus is unable to invade the living parts of its host is shown further by several other features. Cases of recovery were met with where the fungus had died out apparently after having exhausted the resources of dead tissue in a wound; where the wound was above ground isolated from other sources of food supply the sporophore was invariably small in size, or as one might put it, the size of the sporophore was proportional to the dead wood present and not to the size of the stem; the ends of broken roots were often found imbedded in large growths of the fungus, but when cut open the root showed a normal callus and an absurdly small amount of dead tissue at the end; moreover, in sections made of such roots and of the dead tissues about wounds, no mycelial filaments could be seen in any living tissue although such filaments were quite plentiful and evident in the dead parts. All evidence, therefore, goes to show that the parasite is unable to attack the living host. On the other hand, its constant association with wounds seems to indicate that a contribution of some kind must be made by the host and certain features point to the tapping of the sap stream as the advantage derived by the parasite. The texture of the sporophore is such that it absorbs water easily and evaporates it readily, while it differs from most other shelf fungi in requiring a considerable amount of moisture for growth. During the damp season of 1912, vigorous growth took place, while in the summer of 1913, which was very dry, the amount of new tissue produced was very small; hence the probable value of the sap supply as a source of water if not of other substances desirable as food.

Spore cultures were obtained from spores shed from a piece of sporophore inverted over potato agar in a moist chamber for a few hours. The cultures grew well on this medium but very slowly, requiring four or five months to cover the slant surface of an agar tube with its low growing mat of tough light-brown filaments. On peach juice agar and agar made from rat dung, the growth was still slower and the cultures seldom exceeded 1½ centimetres in diameter before the agar dried out. On bean agar, bean pods and carrot plugs the growth was more rapid and more diffuse. Nothing but mycelium was produced in any cultures.

From the rubbery or cork-like texture of the sporophores, it was suspected that they might have a constricting action on the stems which they surrounded (Figs. 20, 21, Plate 7) so as to interfere with the conducting functions. That there was a definite shrinkage of the sporophore tissue on drying out was easily ascertained by comparing measurements of cubical portions in the moist condition and after they had dried. It was found that the lineal dimensions decreased on drying by about 8 per cent, and consequently there was a volume shrinkage of about 22 per cent. On wetting these pieces, they regained their former dimensions. As the tissue of the sporophore is very tough and elastic, the shrinkage on drying would necessarily bring about a considerable pressure on those stems which pass through the mass of the sporophore, a condition of affairs which is of common occurrence as will be seen by a glance at Fig. 21. By way of demonstrating the actual existence of such a pressure, two freshly collected sporophores were perforated by a cork borer and a cylinder of sealing wax of exactly the same diameter as the hole was inserted in each, leaving an inch or so projecting. One was

kept moist and the other allowed to dry, both at room temperature. In the former, the cylinder was not constricted, but the squeezing effect of the fungus on drying out is unmistakably depicted in the accompanying photograph of the other plug after its removal. (See Plate 7.)

While the effects of this constricting action could be clearly seen on a large number of shoots which passed through sporophores, it was in no case very pronounced, and it is probable that these stems are able to adjust themselves to the pressure so that little interference with their conducting processes results. In all cases the growth above the sporophores was normal and no indications of injury from this source were to be noted.

In the hope of discovering some simple and effective means of ridding the field of the fungus, several substances which it was thought might have the requisite fungicidal properties were tested. The methods used and the results obtained are as follows:—

1. Formalin, 2 per cent.—Pieces of coarse sacking were dipped in a pailful of the solution and then wrapped around the bases of the plants. A light covering of earth was added to keep in the fumes. After a week or ten days the sacking was removed, and the fungus was dead on all the thirteen plants so treated. Many of them were already being attacked by Penicillium and other mould fungi.

2. Ashes.—A shovelful of unleached hardwood ashes was placed around the base covering the fungus thoroughly, and, as before, a light covering of earth was put on to prevent the ashes from blowing away. Four plants were so treated, and the fungus was killed in each case.

3. Salt.—Three plants were treated by sprinkling a handful of common salt on the growths and on the ground close to the stem. The fungus was successfully killed in each case.

4. Corrosive sublimate, 1 in 2,000.—A pint of this solution was used on two plants. The fungus was killed on one but survived on the other. The failure of this powerful fungicide in this case may be due to imperfect absorption.

5. Copper sulphate.—Twenty grams placed where its gradual solution by rain, etc., would act on the affected plants has also killed the polyporus growth in the four plants under treatment.

6. Lime.—Fresh unslaked lime liberally applied at the base of the plants and on the fungus growths was used without success. The fungus is still alive on the four plants so treated.

7. Sulphur.—Ordinary powdered sulphur at the rate of 20 grams per plant was also used without success. It is possible that in this case better results would have been obtained had treatment been given in the heat of summer when it would volatilize sufficiently to have some effect.

In all these cases, the treatments were given in September and the final examinations made early in November so that ample time was allowed for recovery of the parasites, since throughout this period the fungus was growing well on the untreated plants in the field. It was intended to continue these experiments during the summer of 1913, but there was such a scanty and uncertain growth of the fungus owing to the dry weather that further work was deferred till another season.

Summary.

1. *Pyropolyporus ribis* occurred here only on the Wilder currant and only on the older plants of this variety.

2. In the field under observation no serious damage can be attributed to it.

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3. It is a wound parasite which apparently cannot attack the living tissue of its host or even extend the wounds in which it occurs. It apparently obtains only sap from its living host.

4. Of the several substances tried as remedies, formalin, copper sulphate, common salt and ashes gave promising results in the preliminary experiments, while corrosive sublimate, lime and sulphur were unsatisfactory.

GRAPE

Chlorosis of grapes.—Although cases of Chlorosis or yellowing of grape foliage are to be found throughout the district, they are not at all numerous ordinarily in any one vineyard.

The chlorotic condition may result from:—

1. *Fusicoccum viticolum,* which is responsible for perhaps 50 per cent of the cases, or even more.

2. Poor soil, lack of nourishment. In this case, all the vines are more or less unhealthy but a few of the weaker ones may show pronounced chlorotic conditions.

A particular case of (2) deserves mention. Grapes are often grown on the edges of the ravines, which cut through the level alluvial deposit lying below the escarpment. On the level ground above the ravine and on the richer soil below, the vines are healthy, but just near the brow of the slope where the subsoil is nearest the surface and where leaching is most rapid, cases of yellowing are often met with. It is clearly a case of local soil conditions.

3. Lack of iron in the soil. The quick-growing grape sometimes requires more of this substance than is available in the soil during the short period of growth, with the result that the leaves remain yellowish instead of assuming their rich dark green. A row of grapes in a vineyard suspected of lacking iron was treated last spring with iron sulphate, half pound per vine, and this row was markedly improved by the treatment; its foliage was larger and darker and the cane growth more vigorous than in the adjacent rows.

OAK.

Gloeosporium nervisequum on oak leaves.—Oak leaves were found in a number of cases scattered over the Niagara peninsula, in which there were dead areas bearing *Gloeosporium nervisequum.* In some of these trees, 75 per cent of the foliage was badly affected. It is suspected that the leaf areas were first killed by prevalent late frosts, and that the fungus gained entrance thereafter. Many trees were observed in which the same frost burn was present, but which had no sign of the fungus on the dead parts of the leaves.

OLEANDER.

Oleander leaf spot.—Oleander leaves affected by what is taken to be *Cladosporium microsporum* (Fig. 1, Plate 4) were sprayed with Bordeaux mixture and the results indicate thorough control by this means.

ONION.

Botrytis rot of onions in storage.—Large losses are often sustained by grocers and dealers, who handle large quantities of onions, from a soft rot due to a *Botrytis.* Three hundred crates of onions imported from Spain were destroyed in this manner in the storehouse of one wholesale grocer in St. Catharines, and similar cases are reported from other places. Local grocers are sometimes troubled with this disease as well, which, though occasionally seen in the field, is serious only in storage. It is the practice to freeze onions in the fall and keep them frozen until they are to be disposed of, when they are used quickly before the rot can make any progress.

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Cultures of this fungus were made, and it was found to produce both the Botrytis form and the sclerotia readily in culture. The sclerotia only seem to be formed in the onion at low temperatures, but both forms have been frequently found by the writer on onions kept at 40° to 50° F. (Fig. 4, Plate 4). The sclerotia formed in cultures are similar to those found on the bulbs, and are readily induced by cold. Spore inoculations on onions at room temperature (50°—60°) usually produce only the Botrytis form or at least very few sclerotia. On young onions on the market, the Botrytis form has been observed several times, but not the sclerotia.

PEACH.

The Brown rot fungus in mummified fruit.—The Brown rot fungus, *Sclerotinia fructigena* (Pers.) Schroet., is well known as the cause of the common rot of plums, peaches and cherries, and sometimes of apples and pears. Since the fungus in all these cases is a fruit parasite, never attacking the leaves and being found on the branches and limbs to a very limited extent, it becomes a matter of importance to find out just how the infection is passed over from the fruit of one season to that of the next. It is almost certain that on a tree well sprayed in spring the numerous spores which are lodged in the bark, buds, etc., will be entirely destroyed by the fungicide, and indeed it has been claimed that even without the spray very few if any of these spores will survive the winter. We may look, therefore, for spring infection from three sources: (1) From spores brought into the orchard from outside; (2) from the tree "mummies" —those rotted shrivelled fruits remaining on the tree over winter; and (3) from rotted fruit on and under the ground below the trees.

In regard to the first mentioned source, it may be said that the Brown rot fungus is able to live readily on a number of dead vegetable remains and there is a possibility, by no means remote, that it may survive the winter on these, and produce in spring a crop of spores, which may be carried by the wind and other agencies to the orchard.

In the case of the tree mummies (Fig. 39, Plate 11) there is some uncertainty as to whether spores produced on these in the fall after they have rotted are able to grow in spring after adhering to the shrivelled dry fruit all winter. Attempts made by the writer to germinate these spores in spring gave in a few cases a small percentage of viable spores and in others no growth whatever. This question of held-over spores is of little moment, however, when it is remembered that the fungus remains alive in all these mummies over winter, and in the moist warm days of spring it revives its activity and produces a fresh crop of spores. The writer has tested large numbers of the mummies of plums, cherries and peaches in early spring by placing them in a covered vessel on a moist surface. After a couple of days in a warm room, they invariably produced fresh pustules of the fungus showing that it was still alive within them. There can be no doubt then that these mummies are a real and positive source of Brown rot infection in spring and early summer. The statement is often made by growers that the spring spray ought to kill everything on these mummies. To this a double reply can be made. In the first place, though lime-sulphur is a powerful fungicide for surface use, theoretically it will not kill a fungus in the interior of the mummy Its action is superficial and it dries out before the fluid has had a chance to penetrate. Secondly, there is direct and convincing evidence that spraying is of little use in this case. During the latter part of April and the first of May, mummied peaches and plums were gathered from various orchards in the neighbourhood after they had been sprayed. They were taken from orchards which may be considered to fairly represent the general spraying practice throughout the district, and some of them were from the best sprayed orchards that could be found. These mummies were tested in the same manner as the others, and it was found after a few days that fresh growths of the Brown rot fungus were started on 89 per cent of the peach mummies and on 72 per cent of the plum. In all these tests the lowest percentage obtained was on peaches, 55 per cent, while some gave as high as

100 per cent. There could surely be no more convincing proof offered of the failure of lime-sulphur to destroy the fungus in the mummied fruits on the trees, and I have no hesitation in saying that the only way to avoid the menace of infection from this source is to remove these mummies and either burn or bury them.

There is still the third possible source of spring infection to be dealt with, viz., the rotted fruit lying on or buried in the ground. In this case the infection may arise theoretically in two ways, (1) from the development in spring of a crop of spores such as occurs on the tree mummies, or (2) by the production of the apothecial or spring stage of the fungus (Fig. 41, Plate 11) from the hard black tough masses (sclerotia) in the withered fruits (Fig. 40, Plate 11). In regard to the first possibility—that of the development of ordinary spores from these ground mummies—I may say that it is only in rare cases that this has been observed to happen in spring. It must be remembered that the condition of a rotten fruit remaining attached to the tree is very different to that of one lying on the ground. The fruit on the tree dries up readily, so that the food material is not exhausted in fall and growth continues as usual in spring. A fruit on the ground, on the other hand, is kept much more moist, so that the nutriment is sooner exhausted, after which the fungus forms the tough, black sclerotia already mentioned. Apparently in going into the sclerotial condition, the fungus undergoes some constitutional change, after which it loses the tendency to form the ordinary spores. A culture of the fungus made in December, when it was just entering the sclerotial condition, has now grown for two years without reverting to the ordinary condition in which spores are freely produced. Whether or not this is the true reason, it is certain that the ground mummies rarely form ordinary spores in spring, so that this means of spring infection may be neglected.

We have still to consider the spring or apothecial stage developed from the hard, black sclerotia formed in the ground mummies in fall (Figs. 40, 41, Plate 11). With the advent of warm weather in early spring, there arise from these black sclerotic masses, small, brown, stalked, trumpet-shaped growths, each bearing thousands of spores of a kind quite different from those ordinarily seen on rotten fruit. When the mature, trumpet-shaped apothecia are jarred, their spores are shot from the inside of the cup-like top, and may be seen momentarily as a fine mist. These apothecial spores when grown give rise to the ordinary stage of the Brown rot fungus again.

If, then, this spring or apothecial stage is found to be present in any quantity in our orchards, it would be quite important as a source of the year's infection. In order to determine its prevalence, an examination was made in the spring of 1914 of twenty-five peach and ten plum orchards in the Niagara peninsula. The ground under a number of trees in each orchard was carefully looked over and the presence or absence of the apothecial stage noted. In presenting the results, it should be stated that the figures given are probably below the real values owing to the impossibility of taking into account trees under which the apothecia had not yet developed and also those under which they had matured and vanished. In the twenty-five peach orchards, there were examined a total of 515 trees of which 239 or 46·4 per cent had apothecia present beneath them. Similarly in the ten plum orchards, 229 trees were examined and apothecia found under 181 or 79 per cent. These results are further supported by observations made in 1912 and 1913. In these two years, although no systematic records were made, the apothecia were noted to be quite as prevalent as in the present year. Judging from these three years, therefore, it is plain that the apothecial stage of the Brown rot occurs generally in quite sufficient quantity to be dangerous as a source of spring infection.

The preceding discussion makes apparent the importance of destroying the mummied plums and peaches. As regards those on the tree, it is easy to get rid of them at pruning time by knocking them off, after which the early cultivation usually given in commercial orchards will bury them and thus prevent the formation of spores. In the case of mummies which have over-wintered on or in the ground and have formed

sclerotia, the following points are to be noted, since they have a bearing on the question of the disposal of these mummies:—

1. Those mummies which are buried flush with the ground are in the most favourable condition to produce the apothecial or spring stage.

2. If lying on the surface, they either do not produce apothecia at all or the apothecia are few and small, probably due to lack of moisture.

3. If buried too deeply they also fail to develop the spring stage. Of the numerous apothecia examined, nearly all were from mummies within two inches of the surface, and none were found arising from mummies buried deeper than three inches.

4. The production of apothecia depends largely on a continuous supply of moisture in spring, so that a dry spring or a light quickly-drying soil is unfavourable to this stage of the fungus. Apparently drying out is very damaging, if not fatal to the apothecial stage, once it has started to grow.

5. The season for the apothecial stage includes from the last week of April until about May 24th.

6. The ground mummies, like those on the trees, are not affected by the waste lime-sulphur spray from the trees, and the spring stage is produced even though the mummy has been drenched with spray.

7. Very small bits of the sclerotia are able to produce apothecia.

8. The apothecia are usually produced from the mummied fruits of the preceding year. They may in some cases be delayed for eighteen months, *i.e.*, till the second spring, but the rule is as stated. Large numbers of plum and peach seedlings were found by the writer in 1914 with the apothecial stage growing abundantly from the outer part of the fruit (Fig. 42, Plate 11). As these seeds do not usually remain two winters in the ground before germinating, an interesting confirmation for the rule given above is supplied.

9. The spring stage has not yet been found on cherry mummies.

The obvious method for getting rid of the ground mummies is to bury them deeply, at least three or four inches below the surface, and this may be done at any time in fall or spring before the spring stage begins to appear. Disking appears to cover them at just the right depth for growth, so that this process is of little use in preventing contagion from the ground mummies. Ploughing is much better. For those who have only a few plum or peach trees which are not cultivated, it may be advisable to rake up and burn or bury the mummies so as to lessen infection, especially if the fruit is susceptible to rot. It is almost needless to add that all spraying to control Brown rot should be supplemented by some effort to prevent infection from both the ground and tree mummies.

Injury from cannery refuse.—A case has been investigated where large quantities of cannery refuse were dumped in a peach orchard, the owner allowing it to be done on the supposition that the refuse would have some fertilizing value. However, the whole orchard died the following spring from the excess of acid. The trees were taken out, the land ploughed and next year it was again planted in peaches. No evil effects were seen on the second planting, and it is probable that the greater part of the acid was removed during the summer by the washing of rains or by soil neutralization.

A similar injury to the above, though on a small scale, often occurs where piles of refuse fruit are dumped. A sterile spot in the soil results, on which for a year or so nothing will grow. Such piles should obviously not be put in close proximity to trees.

Peach canker.—The prevalence of the gummosis canker (Fig. 11, Plate 6) of the peach in the Niagara District has led the writer to give this disease some attention during the last two seasons. A great deal of damage has resulted from it, both because of the killing of branches by girdling, and the total destruction of many trees

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Fig. 1. Oleander leaves attacked by *Cladosporium microsporum*. Fig. 2. Black Rot of Tomatoes, natural. Fig. 3. Black Rot of tomatoes induced by inoculation with a pure culture of *Macrosporium solani*. Two rot spots and one check are seen on each fruit. Fig. 4. *Botrytis* rot of onion. The outer scales are removed showing the black sclerotia and the gray masses of spores. Fig. 5. Irregular apples. Fig. 6. A typical specimen of the "spindly leaf" symptom of mosaic disease of Tomato.

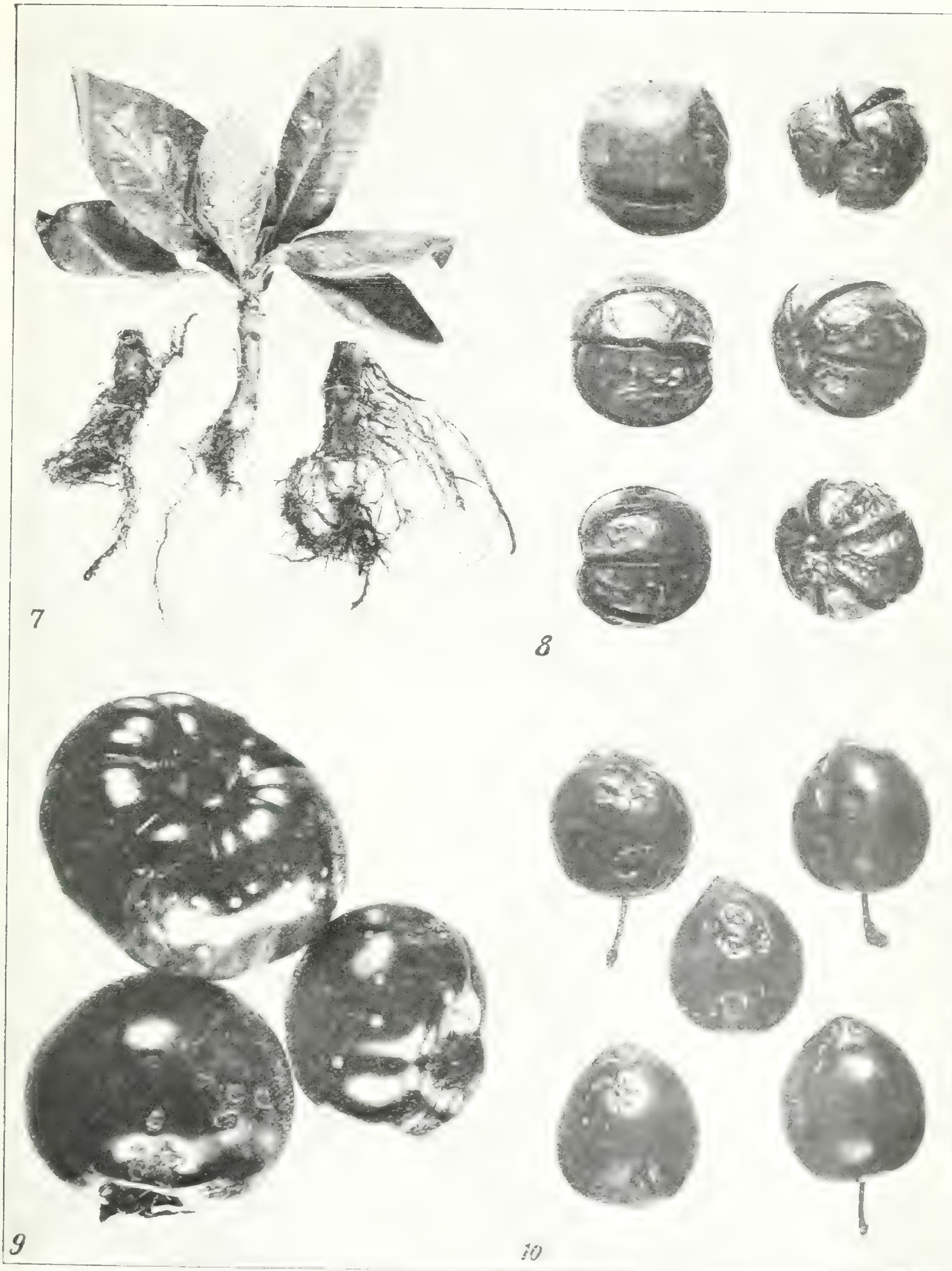


Fig. 7. Tobacco Root Rot. The rootlets are destroyed by the fungus in all three plants. The centre plant which was taken up in the fall, after growing all summer is yellowish and unhealthy in colour, and has grown only a few inches high. Fig. 8. Ogon plums, which split at maturity. Only a few perfect fruits were obtained from this tree. Fig. 9. Tomato spot or scab. The upper and right figure show early stages and the final appearance is shown in the lower fruit. Fig 10. Spotting of Shiro plums due to *Bacterium pruni.*

PLATE LXVIII

Fig. 11. A typical Gum canker on the peach.

Fig. 12. Mummy peaches, from which the Brown Rot fungus has made its way back through the stem to the branch. The area on the branch, which has already been invaded by the fungus is indicated by the dotted line in each case. Cankers sometimes arise from these dead areas.

Fig. 13. An old peach canker cleaned out, and showing the two original fruit spurs by which the fungus gained entrance to the branch.

Fig. 14. A cankered area started about the base of a dead limb. In the second photograph, the same canker is shown with the bark, gum, etc., removed.

Fig. 15. The six cankers shown arose from cracks in the twigs, due to spring frosts. The photograph was made in the following autumn.

Figs. 16, 17. Illustration of the method of treating canker. The first figure in each case shows the canker untouched, the second, the same canker cleaned out and washed with corrosive sublimate 1-1000, and the third shows it again after receiving a coat of paint.

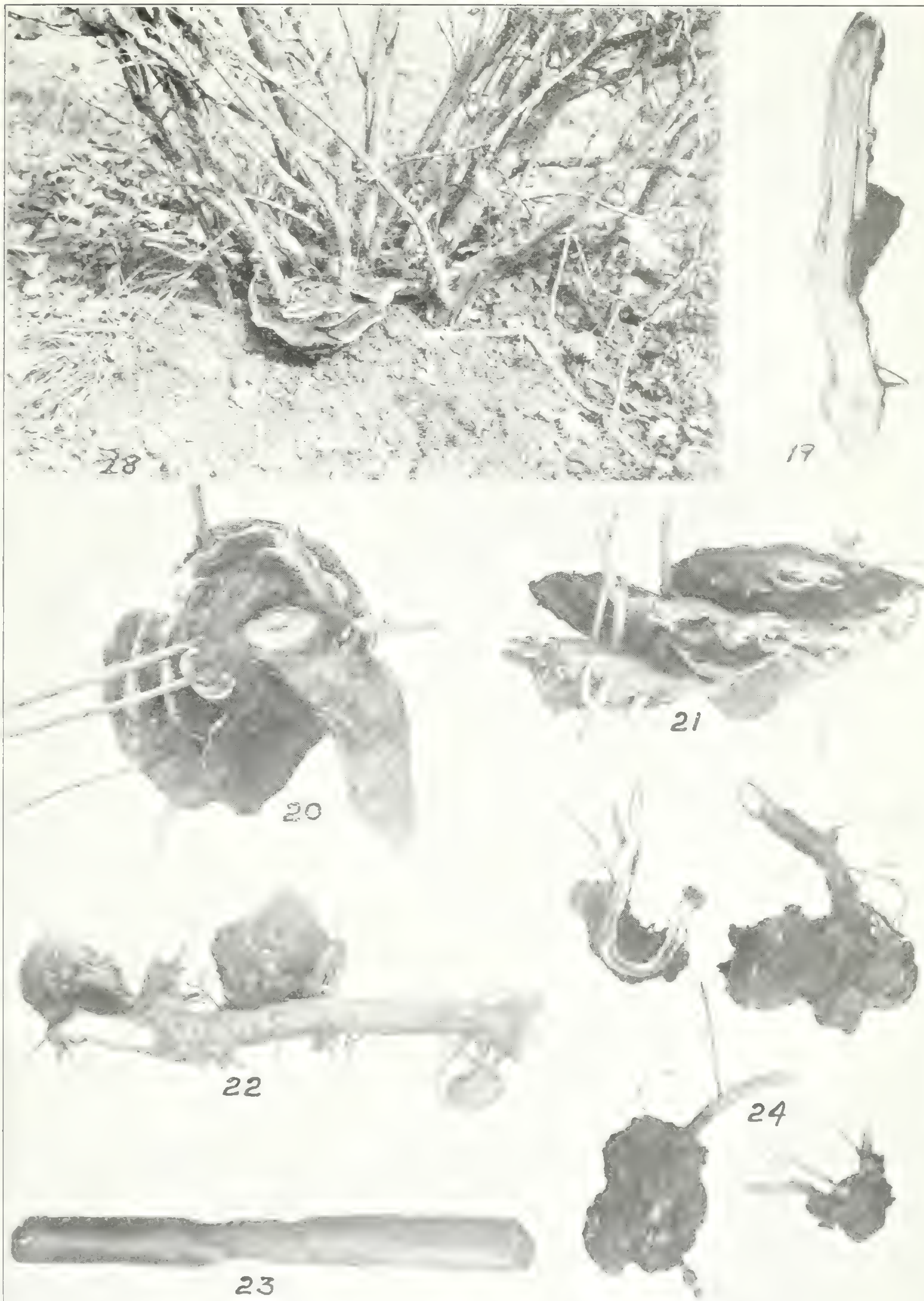


Fig. 18. *Pyropolyporus ribis* at the base of a currant bush.

Fig. 19. A very small sporophore growing on a wound above ground. The branch is split in two.

Fig. 20, 21. Typical sporophores of *P. ribis*.

Fig. 22. Large lump masses of *P. ribis* growing on an undergr und root.

Fig. 23. Sealing-wax plug constricted by the drying of a piece of *P. ribis* through which it had been inserted while the tissue was still moist.

Fig. 24. Masses of *P. ribis* growing on roots beneath the surface.

Fig. 25. Typical case of drooping of canes on Wilder currants. Figs. 26 and 28. Fig. 27. Several branches showing the characteristics of the drooping. The upper figure in 28 shows the effect of two consecutive seasons of wilting. Fig. 29. Leaves from the affected plants showing the peculiar chlorotic condition associated with the drooping. Fig. 30. An affected cane split so as to show the brown areas in the pith.

Winter injury on cherry trunks. The result of a frost crack down the trunk associated with the destruction of the tissue within the growing region by severe cold.

Figs. 31, 32. Photographs of the trunks as they appear the fall after the injury.

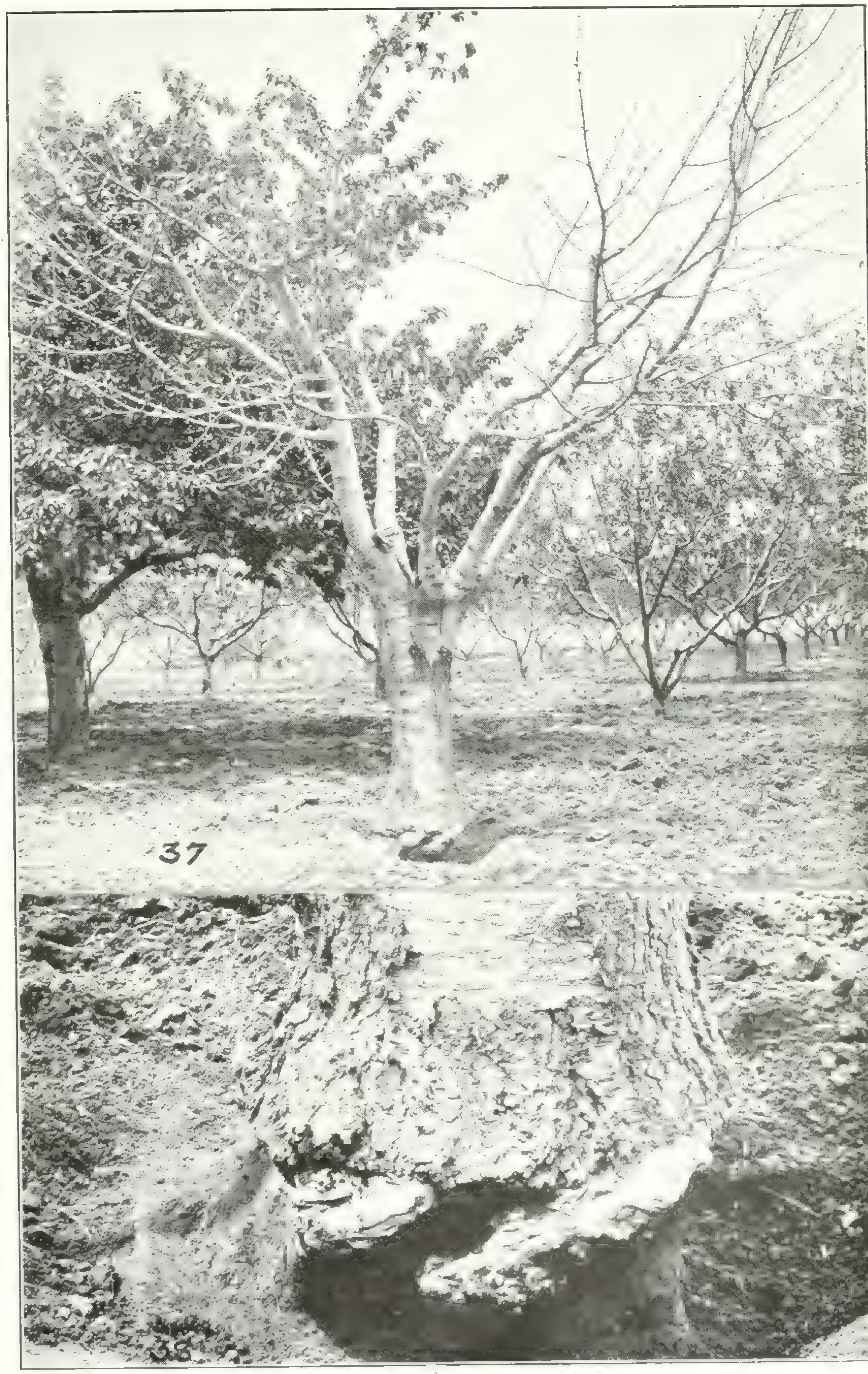
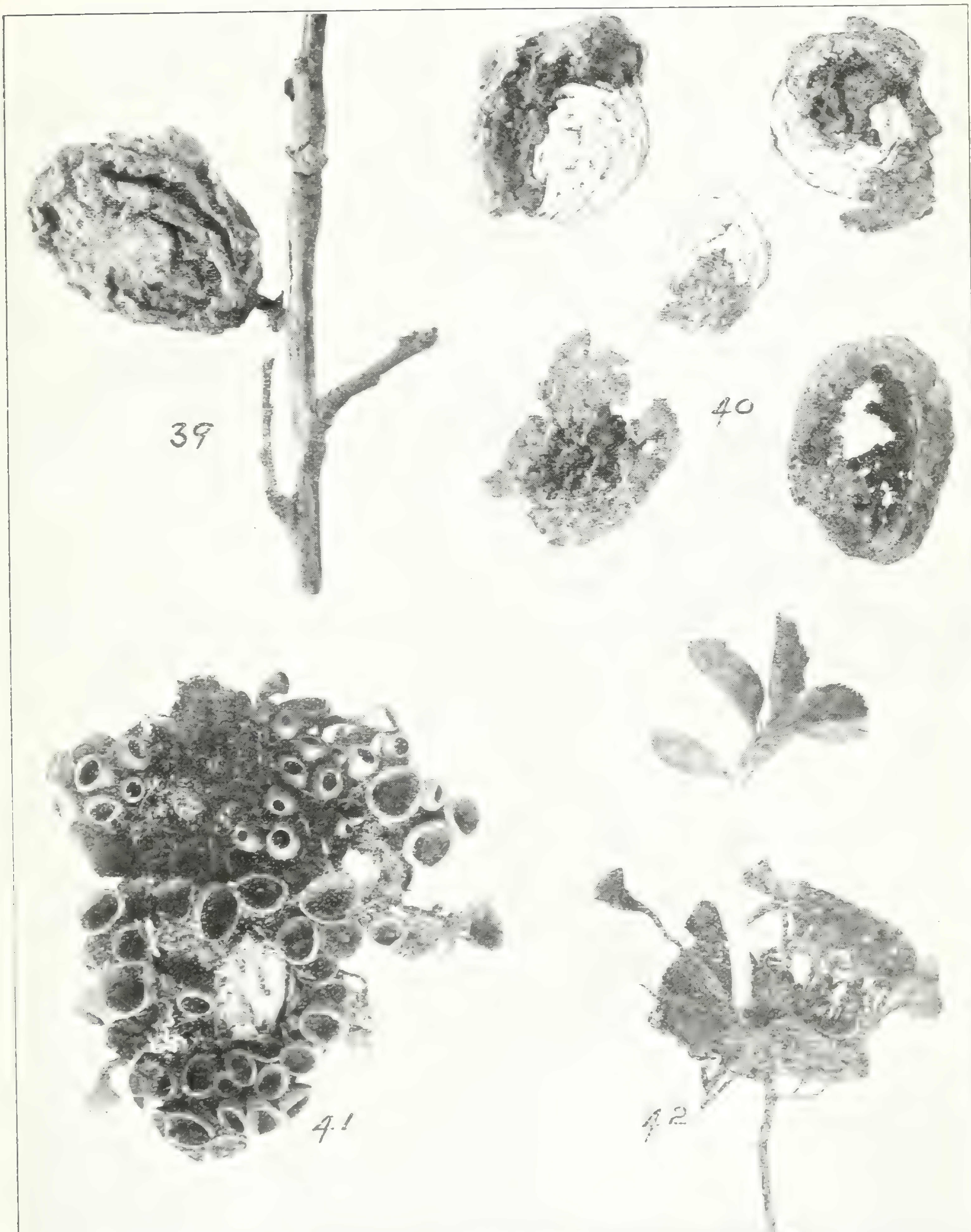


Fig. 37. Shelf fungus (*Fomes applanatus* (Pers.) (Wallr.) on cherry. Fig. 38. The lower photograph is an enlarged view of the trunk, and shows the knob-like fungus growths at the irregular graft union.



Brown Rot on peach and plum mummies.

Fig. 39. A mummied peach adhering to the tree over winter.

Fig. 40. Sclerotia formed on fallen peaches. These black tough masses form in the fall, and in spring give rise to the apothecial stage of Black Rot.

Fig. 41. Cup-like or goblet-shaped apothecial stage growing from peaches over-wintered on the ground.

Fig. 42. Brown Rot apothecia on a plum seedling.

where cankers attacked the trunk. The crotches where the main branches join the trunk are often the seat of trouble, and an active canker in this region soon eats completely around the stem and kills the tree.

Numerous other trees are known to be affected by similar canker troubles, and as a great many of these are known to be due to the action of fungi, there is a strong probability that those of the peach have a like cause. Among others, Jehle in 1912 has published a paper on the subject, in which he attributes these cankers on the peach to the work of the Brown rot fungus (*Sclerotinia fructigena*). He has obtained this fungus consistently in cultures made from the tissue of cankers, and has succeeded in inducing cankers by inoculation of healthy peach limbs. An important point of evidence, which further connects the Brown rot fungus with canker, is in the tendency to canker formation at the base of twigs killed by the Brown rot, which has made its way down the twigs from mummied fruits remaining on the tree (see Figs. 12, 13, Plate 6). A certain proportion of cankers arise in this way, but they may also have their origin at the bases of twigs killed by other causes, or at wounds made in pruning, or even under the unbroken bark, where the possibility of parasites being the cause is very small. Moreover, cultures made from such recently formed cankers, where the bark was yet unbroken, remained invariably sterile. Even from older cankers, cultures made in this laboratory gave several fungi, but Brown rot was rarely present.

Besides these discordant details, there are certain other features which seem to indicate that Brown rot is not the only causal factor, or at least, that there are other contributory causes. In the first place, peaches have been grown in the Niagara peninsula for over forty years as a commercial crop, but it is only since the year 1908 that the canker has become noticeably abundant or indeed common. Many orchards twenty to thirty years of age still exist, and the present condition of these bears out the assertion of the older growers that, up till the time stated, there was little or no canker in our peach orchards. Brown rot has, of course, always been present, and it seems strange, if it alone were the cause, that cankers should not have been prevalent until recent years.

Again the occurrence of canker in more or less localized areas is another feature of the disease that Brown rot infection can scarcely explain, and it is to be noted that high and well-drained land is exceptionally free from canker troubles, although they have their full share of Brown rot on the fruit. The level alluvial stretch of land lying between the escarpment and Lake Ontario contains the orchards worst affected, while the higher and more broken lands about Stamford and Fonthill are comparatively free from canker.

Observations made by the writer seem to indicate that excess of water in the tree is favourable to canker, and that the lack of air, drainage, as well as superabundance of soil moisture are to be considered. In both respects, the highlands have the advantage over the level land below the escarpment. In this connection, it may be noted that the rapid extension of cankers takes place in spring when moisture in the tree is at its maximum.

There is still another factor, which it may be necessary to take into account in settling the cause of canker, viz., the effects of winter. The irritation of the canker stimulates the growth of an abnormal callus tissue around it, and an examination of this growth during the fall shows that its cambium is still active long after the ordinary growth of the tree has ceased. Such immature callus tissue is extremely liable to be killed by the low temperatures of winter, and the canker is extended in the spring. In another note, contributory evidence on this point is presented, and it is there pointed out that the tissues of a newly-formed canker, or the tissues at the edge of an older one, are strikingly similar to the tissues in a typical frost injury. There is the same browning of the wood cells and the same formation of gum cavities, both of which features differ materially from the conditions found in an ordinary clean

wound. It is possible that the origin of those incipient cankers found under the unbroken bark may also be due in some measure to winter injury, and that in other cases the same cause may materially contribute to the increase in size of cankers already formed.

No other means can be recommended for the treatment of cankers than removal of the gum and dead wood and then washing with corrosive sublimate 1-1000, or Formalin 2 per cent, after which a protective covering of paint, or some very adhesive whitewash will ensure the cleanliness of the wound for a long time. Figs. 16, 17, Plate 6, illustrate the method, and they have given good results wherever intelligently carried out. It will not pay to apply such treatment to all cankers on the tree, but in the case of those around the trunk and main limbs, which threaten the safety of the whole tree, it will pay many times over. One of the greatest losses from canker arises from the breaking down ot branches in the stress of a storm, or from the weight of a crop, because the heart-wood at the canker has been weakened by rot. The course of treatment advised above keeps this wood sound until the limb has been strengthened by new growth.

Peach canker arising from frost cracks.—In the spring of 1912, there occurred several frosty nights at the time when the peach buds were swelling. In most cases, no injury followed to either fruit or foliage, as the temperature fell only a few degrees below the freezing point. In a few trees, however, which appeared to have started somewhat earlier and were therefore filled with sap, these frosts caused the twigs to split and the buds to burst from them. The injury was purely mechanical and was evidently due to expansion in freezing of the excessive amount of water in the tissues. Less advanced trees were uninjured, and all the buds on the injured trees, which were not forced off by the ice, were quite unhurt. One of these trees which was watched throughout the summer bore a heavy crop of fruit, for in it the injury was mainly confined to the sappy centre shoots.

In a few days after the injury the cracks in the twigs began to exude copious masses of gum, and sections of such twigs made at this time showed the presence of gum cavities in the wood at each side of the cracks. The general condition of the tissues at this stage bore such a striking resemblance to the features found in an ordinary canker, that the question naturally arose: Is frost injury not sometimes a contributory cause of canker?

It is somewhat significant that on the tree in question, numbers of these twig cracks later on developed typical cankers, which, before summer was over, had girdled and killed their respective shoots (Fig. 15, Plate 6). It is not intended to exclude in this case the possible later infection of these cracks by Brown rot or other fungi. Such infection was extremely liable to occur, but even if the production of the finished canker is attributed to the action of fungi infesting the crack later in the spring, such an assumption does not invalidate the conclusion that the frost in this case produced not only a wound, but a wound of such a nature as to be favourable to the formation of a canker, and exhibiting the pathological features of the tissues found in ordinary cankers. As mentioned in another connection, there is some ground for suspecting that the killing of soft or unripened tissue by freezing may be a contributory factor in the annual increase of old cankered areas, and the behaviour of the twigs split by frost is confirmation of that suspicion.

Germination of peach pits from yellows trees.—It has been contended by many nurserymen that pits from diseased peach trees are not capable of germination and that, therefore, there is no danger of introducing the Yellows and Little Peach through the seedling stock used in budding A good deal of divergence exists among the results of various investigators who have tested diseased pits, so it was considered advisable to make further tests with locally produced seeds. One thousand two hundred pits were taken from fruit of badly diseased trees, and these pits were buried over winter in six

inches of soil. In the spring they were cracked and without allowing them to dry out, they were planted in rows in light but fertile soil. Of these, 8 per cent grew and produced seedlings perfectly healthy in appearance. Concurrent experiments by Mr. L. Caesar, Provincial Pathologist, carried on in a similar way, but with pits from other sources, gave also between 7 and 8 per cent of germination.

These results show that where home-grown seed is used for nursery stock, there is some danger of the disease being carried into the orchards by means of infected nursery trees. The seedling trees at the age of two years showed no sign of disease.

Cracking of peaches.—A good many Crawford peaches were noted during the peach season, in which a large crack had developed at the stem, often extending into the pit which was also split open. Sometimes gum was produced in these cracks, and in many cases fungi had invaded them, rendering the peach somewhat unsightly. The Macrosporium so constantly associated with Brown rot on mummied peaches was the most prominent of these fungi. The cracking, it is believed, resulted from rapid and unequal growth of the fruit in the warm, moist weather, which succeeded the pronounced mid-summer drought.

Winter injury to peach buds.—The winter of 1913-14 will long be remembered by the peach growers of the Niagara peninsula as the year of the "Big Freeze." Never before in the history of the local peach industry was there such wide-spread failure of this crop. Only a few orchards bore fruit at all, and these in small quantities, while hundreds of others had from a few dozen peaches down to absolutely none.

In such a remarkable year, it is well to carefully note the various factors which resulted in this failure, and to lay by for future use whatever lessons may be gained therefrom.

The fall of 1913 was characterized by an abnormally high temperature, which also persisted long into what should have been the winter period. There were a few slight frosts, but in general the ground remained unfrozen until January 15. Although wood growth did not occur to any extent on account of this open weather, the fruit buds developed far too much and consequently were in no condition to meet severe cold. Within a few days after this date, the temperature fell to nearly 15° F. Afterwards a period of milder weather set in, followed by a second and more extended cold wave in February. Although the actual records are not available, it would seem that the temperature did not fall much if any below the danger point which, for the district, is considered to be about 15° F. Owing to the tender condition of the buds, however, and to the suddenness of the attack, the results were disastrous to the peach crop.

Besides the destruction of the fruit buds, other injuries due to severe winter conditions were found to be much increased in number. Twig killing or "Dieback" was noticeably more pronounced, and a larger number of trees than usual died of Collar rot during the ensuing summer. Heart brown of the wood also occurred in a large number of orchards.

All these losses, however, were quite insignificant compared to the destruction of the peach buds, and any lessons that may be learned are particularly valuable in so far as they give hints as to means by which future protection may be secured. It is unfortunate that the injury was so universal as to give fewer means of comparing the advantages and disadvantages of different conditions, than a less complete destruction would have allowed, but there are still a few clear and outstanding features which are worthy of consideration.

In the matter of varieties that escaped, there is little to be said, as there was a great lack of uniformity in this respect. Probably on the whole Elbertas suffered most, while a list of the varieties that survived would include E. St. John, Longhurst, Early Rivers Fitzgerald, Triumph and one or two others. Seedling trees were in several cases noted to be less injured than the ordinary budded stock. The severity of the freezing was such, however, that any extended comparison of varietal resistance was impossible.

Again there were several orchards or small districts which escaped complete destruction and bore a small crop. In such cases, nearly all varieties were represented, although those in the list given above were least injured. Such small areas occurred at Queenston, St. Davids, Fonthill and Grimsby, with a few scattered orchards and individual trees elsewhere. In some of these cases it is very difficult to account for the freedom from injury, while in others the favouring factor can be readily seen.

In one or two cases, proximity to the lake seems to have been responsible for some slight immunity, but this was of such small general importance as to be negligible. The chief factor in the escape of both individual trees and of orchards seems to have been good soil drainage, which gave dry conditions during the fall and retarded the development of buds. Dulverton orchard at Queenston and some Fonthill orchards are examples of this. In the former, the soil is a coarse and deep gravel draining into the Niagara river; in the latter, the land is hilly and the soil a deep, sandy loam. There are numerous individual cases which confirm the view that the presence of too much water rather than extreme cold was the prominent factor. In several cases, limbs broken down but still attached to the tree bore blossoms while the rest of the orchard was blank. In one orchard parcelled out in building lots, several trees, which had been cut off in the lots and left for two years weed grown and uncultivated, bore blossoms and set fruit, while the rest of the orchard had nothing. Cankered limbs seemed to survive better than healthy ones, and weakly trees were surprisingly safe, presumably because their buds were less advanced than those of their vigorous neighbours.

Some protection was afforded in certain instances by snowbanks which covered a limb or part of it, and a few trees in protected garden orchards in the town of St. Catharines bore a small crop.

It may be that very little can be done to protect an orchard from a winter such as this, but it is probable that, where we have to undergo one such winter, we shall have twenty others less severe in which a little protection will be valuable. The evidence shows that every means that can be used to dry out the soil in the fall, and thus retard the development of the fruit buds, tends to secure safe wintering. The various means that may be adopted for this end include:—

1. Thorough drainage, by under-drains, if necessary.
2. Avoidance of late cultivation which retains soil moisture. It is advisable to cease cultivation as soon as enough moisture to develop the crop can be assured.
3. Cover crops can be planted to advantage. They take up and evaporate the soil water and also temporarily retard the growth of the tree by taking up some of the readily available food material.

PEAR.

Pear blight epidemic.—During the spring of 1914 this disease, variously known as Pear Blight, Blossom Blight, and Fire Blight, attained the importance of an epidemic in orchards throughout a great part of Ontario, and in not a few cases caused immense damage. For the better understanding of a discussion of the causes which led up to, and favoured the excessive development of the disease this year, it may be valuable to note first a few of the outstanding features of the Pear Blight disease.

It is caused by bacteria, which infect the soft or sappy tissues of apple, pear, and quince trees, and which destroy the blossoms and young fruit (Blossom Blight), twigs (Twig Blight), leaves and shoots (Fire Blight), or limbs and trunk (Body Blight). Usually all the bacteria in an affected limb die during the winter, owing to the drying out of the tissues, but in a few cases they remain alive, and it is from these that infection starts again in spring. The infection is spread to the blossoms mainly by insects, and when a few blossoms are infected the bees readily spread the organism to other trees and to other orchards. The bacteria develop very rapidly in the blossoms, and

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these are killed, after which the organism works its way down into the twigs and limbs, killing them as it progresses. In apples and quinces, there is usually nothing more serious than blossom and twig destruction, but in pears, and especially in susceptible varieties, large limbs and even whole trees are destroyed.

The means adopted to control Blight in pears involve (1) cutting out thoroughly and remorselessly all blighted limbs in winter time, and (2) regularly inspecting the orchard during the summer and taking out all blighted parts, taking care to cut well below the apparent limits of the disease. It is necessary to cut from six inches to a foot below the apparently diseased part because the bacteria, in summer at least, have usually advanced much farther within the limb than is indicated outwardly by the black and shrunken bark. It is probable that when the bacteria have ceased to advance rapidly, as might be expected in late fall and winter, the blackening and shrinking of the bark more nearly keeps pace with the progress of the organism within, and for this reason it is not necessary in winter pruning to cut so far below the apparently diseased area as in summer pruning. In Text Fig. 1, there is shown diagrammatically the difference between the summer and winter conditions in this respect.

With the above outline of the disease by way of preface, a few remarks concerning the epidemic of 1914 may be now made. In reviewing the situation, it is necessary to go back to the fall of 1913, which, it may be recalled, was exceptionally mild and more than usually moist. Because of these weather conditions, the trees did not dry out sufficiently to cause the death of the bacteria in the blighted limbs then existing. In consequence, there were far more of these limbs than usual in which the bacteria were safely wintered. It should perhaps be added that the numbers of such blighted limbs were not reduced, as they should have been, owing to neglect and lack of vigilance at pruning time, so that in the spring of 1914 the sources of infection were far more numerous than in ordinary seasons.

During the spring weather conditions again helped the disease. The weather record at blossoming time shows a period of fine, bright, calm days—ideal weather both for the development of the bacteria in the nectar of the blossoms, as well as for the activity of bees, which were thus able to spread these bacteria thoroughly all over the orchard. Doubtless other insects also played a part in inoculating twigs, leaves, and blossoms, but evidence as to the work of bees is clear and unmistakable. The general result was wholesale inoculation of apple, pear, and quince blossoms. With regard to apple and quince, there was comparatively little damage beyond the blossom and twig blight, and its consequent effect on the crop, but the infections on the pear progressed from these initial points in a way that was disastrous.

Here again for the third time weather conditions were on the side of the disease, for all spring and summer up till the end of June were so wet that moisture in the tree was plentiful, and the growth consequently was soft and sappy, thus presenting the very conditions favourable to the growth of the bacteria within the limbs. During this period, even in Kieffer pears, which are to some extent resistant to limb and trunk blight, the disease made discouragingly rapid progress, and large limbs and whole trees were destroyed. In more susceptible varieties such as Bartlett, the damage done in some orchards was irreparable.

It may be that only an occasional year will bring such an epidemic as this, but there is no doubt that, when weather conditions are again favourable, the same thing will happen in due course. We cannot control the weather, but the course of this epidemic points out in a very striking way the necessity of eliminating from the orchard during fall and winter every bit of blighted wood which might carry live bacteria over into the succeeding season, and which might in this way be the focus, so to speak, from which widespread destruction might develop.

Sunburn on pear foliage.—In common with a number of other trees, both wild and cultivated, occasional cases of sunburn were met with on pear foliage. No serious

Text Figure 1.

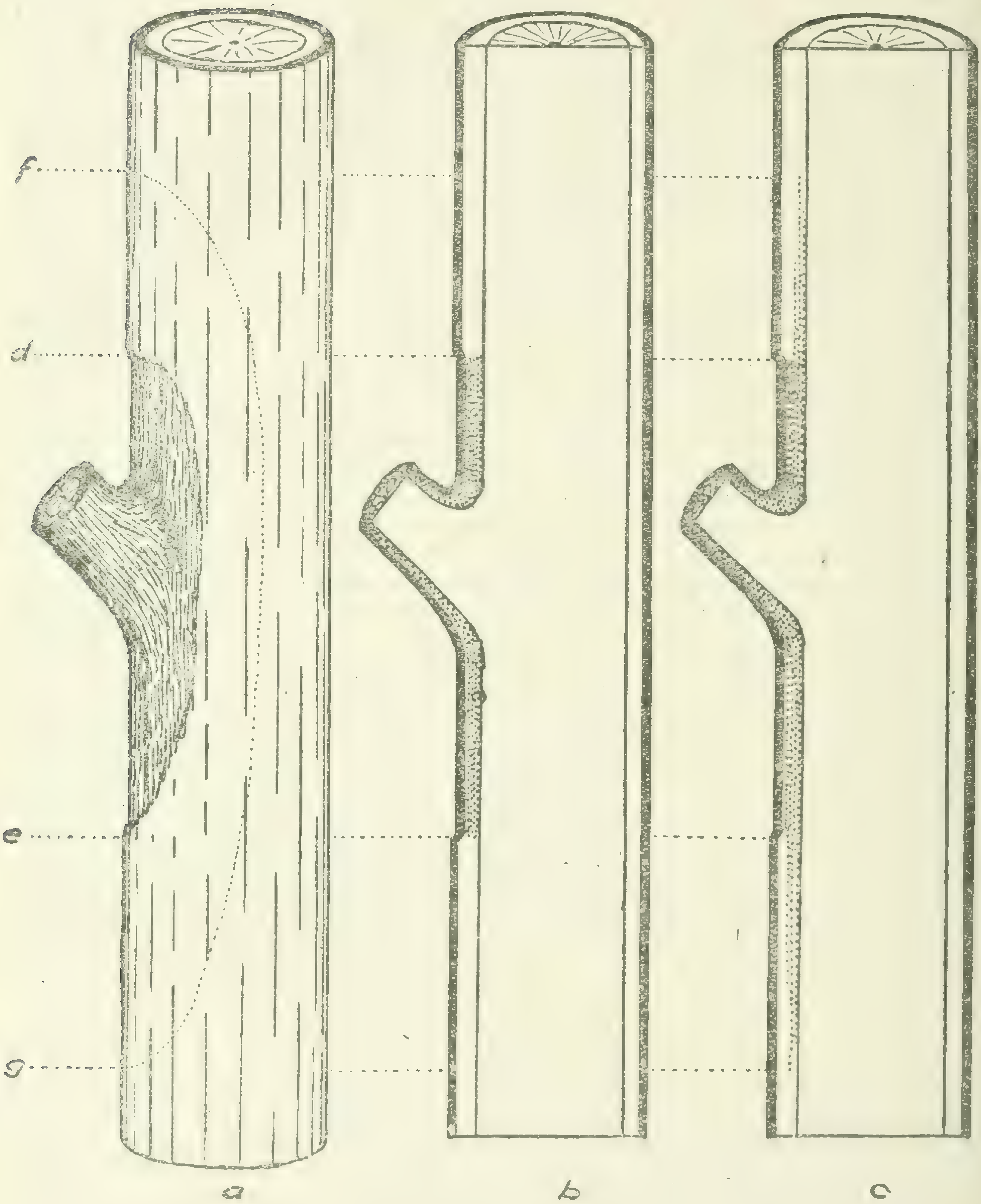


Diagram of branch of pear affected by Blight.

a. Exterior view showing darkened and shrunken bark (*d-e*).

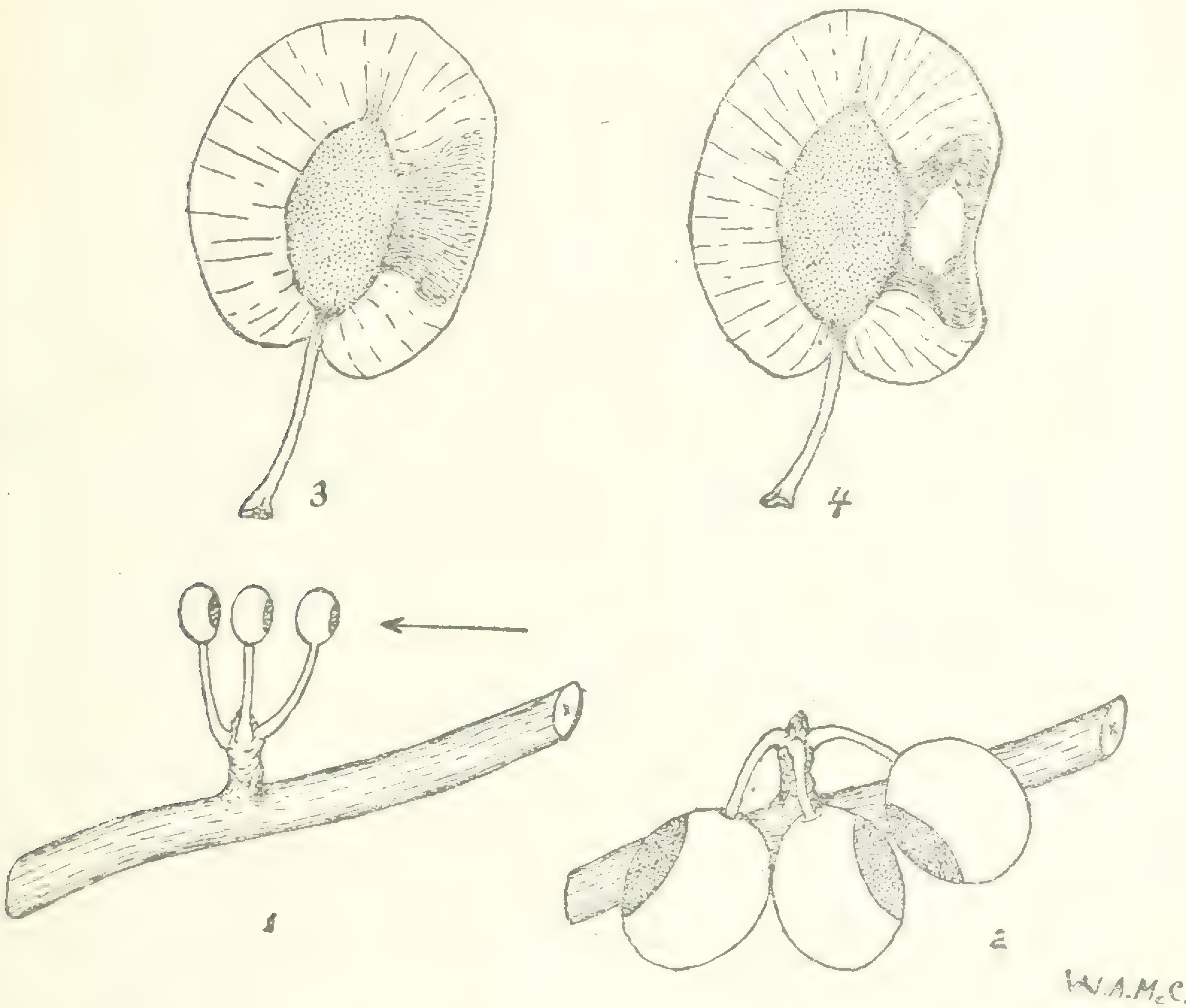
b. and *c.* Sectional views of same branch (*b* in winter, *c* in summer), the bacteria indicated by dotting.

In cutting out the blighted area shown in *a* in winter, a cut between *e* and *g* would be below all bacteria. But in summer pruning a cut between *e* and *g* would be right into the infected area as seen by a glance at *c*. In order to get below the bacteria in summer, it will be necessary to cut below *g*, or, in other words, 6 inches to a foot below the apparent limits of the diseased area.

damage was done in any case, but such injury is liable to be mistaken for the work of the Blight organism. One point of difference was noted, which helps to distinguish the sunburn from Blight. In cases of sunburn, there are usually some leaves slightly injured, and it will be found that these have the dead areas between the veins. In this as in other cases, the sunburn resulted from hot and dry weather following a moist period, wherein the leaf growth was rapid, soft, and unresistant to drought.

Text Figure 2.

Sun Scald on "Omaha" Plums.



1. Young plums at the time of injury.—The dark spot indicating the injury is on the south side, the arrow showing the direction of the sun's rays.
2. The same three plums later.—In drooping over the spots were in some cases turned away from the sun.
3. Section of an affected plum.—The brown scalded area is indicated by dark shading.
4. A more severely injured fruit.—In this case the brown tissue has collapsed leaving a cavity.

PLUMS.

Sun scald of plums.—During the summer of 1914, attention was called by F. M. Clement to a peculiar spotting of Omaha plums at the Vineland Horticultural Experimental Station. These plums were large and well shaped, but a large proportion of the fruit on the two trees of this variety developed dark tissue in the flesh on one side at maturity. On the surface the skin was unbroken but the area above the spot was

depressed slightly and minutely pitted owing to the collapse of the lenticels. A diagram of a section of an affected fruit is shown in Text Fig. 2 (Fig. 3). The brown tissue extends in wedge fashion from the skin to the pit, and in some cases this dead portion has collapsed leaving a cavity (Fig. 4). No fungus filaments were found in any of these fruits, nor did the browned area extend when the plums were kept in a warm room for over a week. Test tube cultures of the affected tissue remained sterile. From the fact that the great majority of these spots were found on the south or southwest sides of the fruits, it is considered that this spotting is a form of sun scald (Fig. 1). The fact that in some cases the spots were on a surface not directly exposed to the sun does not necessarily conflict with this view. The dropping of the fruits when increase of weight took place would obviously bring about a change in orientation with reference to the southern exposure as illustrated in a diagrammatic way in (Fig. 2).

Such an interpretation would indicate that the injury must have occurred at a comparatively early stage, and it is interesting to note that the weather record is in agreement with this view. June, 1914, was cool and moist, but was succeeded by a hot dry July, thus presenting ideal conditions for an injury of this nature.

No variety other than the Omaha was affected in this orchard, but it is probable that a number of other varieties might suffer in this way, when the weather conditions are favourable.

Splitting of plums.—Several cases have come under notice where Japanese plums principally of the Ogon variety have developed splits in the fruit at or near maturity. The splitting extends uniformly from the stem and around to the opposite or style end in meridian fashion, and the fissure ordinarily reaches halfway to the pit. (See Fig. 8, Plate 5.) In several orchards this variety has been entirely discarded because of the impossibility of getting perfect fruit.

Bacterium pruni on Japanese plums.—This parasite has been met with in only one orchard in the peninsula on Japanese plums (Shiro). Several other varieties were slightly affected but from 20 per cent to 30 per cent of the Shiro fruits were more or less spotted by the disease (see Fig. 10, Plate 5).

RASPBERRY.

Raspberry cane blight (*Coniothyrium Fuckelii.* Sacc.)—This disease was present in a number of fields in the district, but was particularly severe in one field of the Gregg variety, and Bordeaux mixture was tried on this field. Careful sprayings were given on the following dates: 1912, November 20; 1913, April 21, May 6, May 31, June 23, August 19, September 6.

During 1912, the old canes had been allowed to remain until October 26, but in 1913 they were taken out on August 15, shortly after the last of the crop was picked. In 1912 only half the field was sprayed, but, beginning with August 19, the whole field was treated. In spraying, care was taken to cover every part completely, and to thoroughly drench the old cane stubs at the earth's surface.

In spite of the number of these sprayings and the care exercised in their application, no benefit whatever resulted and the blight was just as bad in the sprayed as in the unsprayed portions.

The infection of the young canes was carefully watched for, and, though the old canes began to die from May 15 on, there was no sign of blight in the young growth till the first two weeks in July. Infection occurred in the following ways:—

1. Through the pruned ends of young growth topped to encourage side shoots. This was by far the most common means of infection.
2. From dead leaf stalks on the stems.
3. From small wounds such as thorn scratches, etc.
4. From one cane by way of the underground stalk to an adjacent cane.

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STRAWBERRY.

Botrytis rot of strawberries.—A number of strawberries showing bleached soft watery areas have been examined. In all of them, fungus filaments were present in the soft-tissue. Test tube cultures from such tissue invariably gave a *Botrytis* growth, and affected fruits kept in a moist chamber developed external growths of *Botrytis* in a few hours. In the field, this rot was found to be present on fruits in all stages of ripeness and half-grown berries were frequently seen shrivelled up and covered by the same fungus. The rotting of the fruit was serious in one or two fields. It was most severe in conditions of high humidity, especially where weeds had been allowed to grow, and thus retain air moisture during the day. During a few days of warm and very damp weather, there was a great deal of the rot in the two fields mentioned, but it almost disappeared during the ensuing hot and dry period.

SWEET PEA.

Mosaic of sweet pea ("Streak").—This disease was found to be prevalent in an Ontario greenhouse in the winter of 1912-13, and was so general among the plants that a good deal of loss resulted. The origin of the infection cannot be explained. Efforts were made to inoculate the disease, as is readily done in the case of tomato and tobacco mosaic. The juice from the macerated leaves of diseased plants was injected near the growing points of ten healthy plants growing in the laboratory, for which purpose a fine-pointed hypodermic needle made of drawn glass tubing was used. The inoculation was again performed in a similar way after two weeks' time, but the plants reached the flowering stage and died without showing any signs of the disease. Mr. L. Caesar, the Ontario Pathologist, in similar inoculation experiments concurrently carried on, found the disease transmitted in this way, but only a small number of his inoculations were successful.

As additional tests, seeds from affected plants were sown in clean soil and seeds from clean plants in soil taken from the diseased beds. In both cases, the resulting plants matured and blossomed without showing disease.

From observations made in the greenhouse in question, it seems probable that, as in the case of the tobacco mosaic, the disease is spread from plant to plant by insects.

TOBACCO.

Tobacco root rot.—The tobacco fields in Essex County, Ont., have for some time been troubled with the root rot (*Thielavia basicola* (B. & R.) Zopf.), which has spread to such an extent as to seriously affect the crop over large areas. This disease is well-known in the tobacco regions of the United States, and no satisfactory remedy has as yet been found for it. Fig. 7, Plate 5, is a photograph of the roots of three plants in which the disease had been at work throughout the season. The rootlets are destroyed as fast as they are formed, and when the plant is pulled up the rootlets break off very easily. An examination of the root system of a diseased tobacco plant will show that the rootlets are dark, dead and discoloured. The root rot does not kill the plants outright, but retards their growth so much that they are worthless. The top has been left on the central plant in Fig. 7. The leaves on it are small, yellowish and sickly, and, although this plant had been in the field all summer, the top had made only a few inches of growth during the season.

TOMATO.

Mosaic disease of tomato.—This trouble was found in several fields in 1912, and in three of these it was so bad that some attention was given to a study of the disease during the following summer, mainly to determine, if possible, what factors are involved in its occurrence and spread under field conditions.

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Symptoms.—Mosaic may be recognized readily in the foliage, especially in the younger leaves. These have either patches of light or yellowish-green interspersed throughout the normal dark green of the leaf, or in the case of worse affected leaves, the greater part of the leaf surface may be of the lighter colour and the normal dark green areas appear in patches. Since there is a tendency for the dark green areas to grow more rapidly than the sickly yellowish portions, the dark green normal tissue will often be found blistered and distorted from being thus cramped and confined by the surrounding yellowish areas. There is also a tendency in mosaic plants to produce narrow leaves, and, in some extreme cases, the leaf surface is so reduced that the plant becomes almost grass-like in character. The name of "Spindly Leaf" is most appropriate for this feature of the disease, and the appearance of such leaves is illustrated in Fig. 6, Plate 4. "Fern Leaf" is another form of mosaic leaf growth occasionally met with, in which a large number of small leaflets arise from the main rib instead of the few large leaflets found in the normal leaf. Neither "Spindly Leaf" nor "Fern Leaf" are common in the field, the normal form of the disease being the true "mosaic" or patterned leaf described above. The mosaic symptom has been recorded as occurring on the fruit, but has never been met with by the writer. Whether because of the mere weakening of the plant, or through some direct activity of the disease, the blossoms on affected plants often do not mature, and hence there is a smaller setting of fruit on them than on healthy plants. Ordinarily this is of small consequence, as, on slightly affected plants, a sufficient number of blossoms are left to ensure the crop, but when plants are badly affected, there is a marked lessening in the number of fruits set as well as in the size of the fruit. Cases of "Spindly Leaf" set very few fruits, and even these remain small, so that such plants are worthless. In the three fields previously mentioned as being badly diseased, the loss due to the disease was estimated at from 20 per cent to 50 per cent.

Extent of the disease.—Beyond the examination of a few diseased fields, no data were obtained regarding the prevalence of mosaic in 1912, but in 1913 there were examined sixty-one fields, out of which 15 (or 26 per cent) had the disease present to a greater or less extent. In none of them was it so serious as to cause great damage, and in many cases only a plant here and there was affected. No fields were met with, which had an infection approaching that of the three observed in 1912. It is possible that seasonal variations affect the virulence of the disease, but several years of observation are necessary to establish this point.

Infection. A consideration of the factors that might be involved in the maintenance and spread of mosaic leads to an investigation of the following possibilities:—

1. Does the disease remain in the soil over winter?
2. Is it transmitted through the seed?
3. Does the seed bed play any part in infection?
4. Is the disease transferred from plant to plant in the field, and, if so, by what means?

An attempt was made to obtain an answer to the first question by setting out clean tomato plants on the three fields found diseased in 1912. In one of these, the whole field of about one acre was replanted. In the second, 25 plants were grown in the space marked by six young trees, in which space the disease was known to occur in 1912; and in the third, 16 plants were also placed in a diseased square marked by young trees. In the last-mentioned case, additional evidence was furnished by volunteer plants, which came up here and there throughout the rest of the field. Not a single case of mosaic developed in any of these fields, either among the plants set out or among the volunteers. The evidence is, of course, too meagre to justify any general statement, but shows that under some circumstances at least, the disease is not transmitted in the soil. On the other hand, the observations from the 61 fields examined show that the disease is usually worst where tomatoes were grown the previous year.

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The second question, that of transmissibility through the seed, was also dealt with, and seeds collected from the worst diseased plants found in 1912 were grown again in 1913. In order to check the results, some were grown in four different places, viz.: Ontario Agricultural College, Guelph; Central Experimental Farm, Ottawa; Vineland Horticultural Experimental Station, and St. Catharines. None of the plants grown in the three first-mentioned places developed any trace of the disease. Of the 39 plants set out near St. Catharines, six developed the disease late in the season, and there is almost a certainty that the disease was not inherent in these, but was contracted from a diseased plant accidentally placed at the end of the row. The six affected plants were all at this end of the row, and, as previously mentioned, did not develop the disease till late in the season. The results of this work are not conclusive, but they indicate a strong probability that the disease is not transmitted through the seed.

There is good reason to suppose that the seed bed is the source of a good deal of infection. Mosaic plants are often found in rows in the field, half a dozen or more consecutive plants in the row being diseased while those adjacent in adjoining rows are clean. Since plants show the disease thus shortly after setting, before there is time for field infection to appear, it would seem that this peculiar occurrence of the diseased plants can best be explained by seed bed infection. In the ordinary method of putting out plants, those from the same part of the bed are likely to be planted consecutively along the row in many cases. I am assured by several growers of much experience that changing the seed bed often, reduces the disease or eliminates it altogether. Several cases have been met with where plants obtained from one seed bed show disease while adjacent parts of the field planted from another seed bed remain perfectly clean.

That the disease is transmissible from plant to plant, there is no doubt. Various investigators have shown that by injection of the juice of diseased plants into healthy ones, or even by rubbing the plants together, or touching one and then the other, the disease can be induced. Six plants injected with the juice of diseased leaves in this laboratory showed the disease in fourteen days. It is very probable that the disease is spread in the field either by insects, as in the case of tobacco, or by the brushing of the plants by the cultivator harness, etc. No satisfactory evidence has yet been secured on this point.

Spotted tomatoes.—Specimens of tomatoes affected by a superficial black spot (see Fig. 9, Plate 5) have been examined by the writer. The spots began as small circular white or yellowish areas under the skin, and, as the prick of a needle on green or half ripe fruit produces in a few days identically the same appearance, it is probable that insect punctures are responsible for the condition in the field. Later on the spot enlarges, becomes scabby and very black. A very few stray fungus filaments were found in some but not constantly enough to suggest fungus infection. Cultures made from the inner tissue of the spots remained sterile, and the spots on fruits kept in warm, moist conditions developed no further. No rot was caused in any case, the spot being purely superficial, so that the tomatoes were not injured for canning, although their appearance was spoiled for market purposes. That there are certain field conditions conducive to the trouble is evidenced by the absence of any blackening in numerous other cases, where similar white spots resulting from insect punctures have been met with elsewhere. Neither did the needle pricks, which produced the initial stages of the spotting in tomatoes grown on vines in the laboratory develop any blackening. It is suggested that the sulphur compounds in natural gas, which is abundant throughout the district where this spotting was found, may be responsible for the blackening of the spots.

Tomato black spot or black rot.—The causal fungus in this case (*Macrosporium solani,* E. & M.) is usually considered mainly as a leaf parasite by most authors. It is with us of little importance in this respect, and is found only occasionally on leaves

declining in vitality. On the fruit, however, it does occur as a rot fungus, in some cases so plentifully as to cause considerable loss (Fig. 2, Plate 4). It has been found by the writer most abundantly in weedy, and therefore humid situations, and was worst in the late fruit of early tomatoes. In order to determine that the rot was brought about solely by this fungus, cultures were made both from spores and from mycelium in the rot spots. Green and almost ripe fruits were then inoculated under proper antiseptic conditions, and with checks. In each of the ten inoculations made, rot spots were produced which gradually involved the whole fruit. The checks remained quite free (Fig. 3, Plate 4). It was evident from examination of the rotted fruits in the field that infection took place at insect punctures or other small wounds.

Dark green or blue green colour due to cold.—The cold, damp weather of the spring of 1913 caused a large number of the early set tomato plants to assume an unhealthy dark-green or bluish shade, and this condition was associated with very slow growth. Warm and sunshiny weather, however, soon restored them to a normal state of foliage, and no evil effects followed except the loss of a few days of early growth.

"Sooty fungus" on tomatoes.—Some young tomato plants were sent in, which were said to have a sooty fungus on the leaves. The leaves were covered with a black sprinkling much resembling the growth of a superficial fungus. Examination showed that this coating consisted of spores of Coprinus species, which had evidently grown in the hot bed and had shed their spores on the plants before transplanting.

5. GENERAL.

The preparation of nitro-culture.—During the last month of the year, it was deemed advisable for this division to prepare nitro-cultures of alfafa, red clover and peas for distribution to the branch Farms. This material is a pure culture of the organism found in the nodules on the roots of these plants. It has been shown without doubt that the function of these organisms is to fix the nitrogen of the air for the use of the plant. This constitutes the reason for these legumes being soil-improvers—through the agency of these bacteria they actually add nitrogen to the soil in which they are being grown. It very often happens that the soil in which the leguminous crop is sown does not contain this organism, so that no nitrogen fixation takes place. It is in these cases that the nitro-culture becomes of very great use; for the pure culture is mixed with the seed before planting, so that the bacteria can enter the young plant as the seed starts to germinate.

The system adopted for the isolation and multiplication of these legume bacteria was that of F. C. Harrison and B. Barlow given in the Trans. Roy. Soc. Can. Second Series, Vol. XII, Section 14, p. 157, and is as follows:—

The nodules are carefully washed in water to remove all adhering soil particles and then soaked for two minutes in a solution containing a small quantity of bichloride of mercury and hydrochloric acid, taken out and placed on filter paper slightly moistened with the same solution, to remove the excess of liquid on the nodules. They are then placed in sterilized water for a few minutes, one of them removed with sterilized forceps, and a longitudinal cut made in it with a sterilized, sharp, chisel-pointed needle. The point of a sterilized platinum needle is then inserted and moved around in the cut and dipped into a drop of sterilized water in a sterilized Petri dish, and into this is poured the medium in which these bacteria have been found to grow best, viz., a modified Ashby wood-ash agar. The cultures are then incubated at 20° C. In three to five days typical glistening and slightly opaque surface colonies will be seen, and transfers are made from these to a sloped tube culture.

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To make sure that the organism isolated is really the one that inhabits the nodules of the plant under consideration, several tests have to be made, which are as follows:—

1. In culture, the organisms are very typically surrounded by mucilaginous sheaths; this can be demonstrated by air drying some of the material on a slide, flooding for an instant with water, and immediately flooding with gentian violet stain. This treatment causes the mucilage to contract and assume certain patterns or figures composed of bands and strands of fine or coarse intricately interlaced filaments, forming usually quite regular hexagonal figures.

2. Another distinguishing stain is the Kiskalt's Amyl-Gram. This is the same as Gram's stain, except that amyl alcohol is used instead of ethyl alcohol as a decolorizing agent. That is, some of the material is fixed on a slide, gentian violet added and warmed slightly over a flame for about half a minute, poured off and the slide flooded with a solution of iodine in potassium iodide for two to five minutes, and then discoloured with amyl alcohol. This stains the bacteria deep violet in a colourless background.

3. After the pure culture has passed these two tests, a final one is made by planting some seeds of the legume under consideration in six pots of sterilized soil with the seeds treated with the culture in three of them and untreated in the other three. When the plants are about three weeks old, they can be examined for nodules, and, if the plants from the untreated seed have no nodules and those from the treated seed have them, there is no doubt then that the culture is correct. It can then be transferred to media in bottles, and, when sufficient growth is made, it is ready to send out with instructions for its use.

RESIGNATIONS AND APPOINTMENTS.

Mr. J. W. Eastham, B.Sc., formerly chief assistant botanist, resigned his position in April, 1914, to take up a position as plant pathologist under the British Columbia government. In Mr. Eastham, the division has lost the services of a very able and painstaking official, who has rendered very satisfactory service during his tenure of office.

Mr. John Adams, M.A., formerly of the Royal College of Science, Ireland, was appointed to a position under the Destructive Insect and Pest Act in May, 1914, and later received the appointment of Assistant Dominion Botanist. The appointment of an officer possessing, as Mr. Adams does, such excellent qualifications, is most gratifying, and all the more so because of his training and previous experience.

Mr. F. Lisle Drayton, B.S.A., a graduate of Macdonald College, Quebec, was appointed Assistant Plant Pathologist and Bacteriologist in July, 1914. Mr. Drayton's work is mainly of a research and advisory nature, and the services which he has already been able to render have been throughout most satisfactory.

OFFICIAL PUBLICATIONS OF THE DIVISION DURING THE YEAR OF REPORT.

Exhibition circulars:—

44. Potato Scab, by J. Adams.
45. Do you know your weeds? by Faith Fyles.
46. Apple Scab, by F. L. Drayton.

Farmers Circulars:—

No. 6: Regulations under the Destructive Insect and Pest Act governing the importation, sale, shipment and exportation of the Common or Irish Potato (*Solanum tuberosum* L.), by H. T. Güssow.

No. 9. The control of Potato Diseases, by H. T. Güssow.

Bulletins:—

No. 23: Second Series—Medicinal Plants and their Cultivation in Canada, by John Adams.

No. 24: Second Series—Fruit Tree Diseases of Southern Ontario, by W. A. McCubbin.

ACKNOWLEDGMENTS.

The success of the work rests largely with the members of my staff, who are in charge of special subjects. I desire here to record to all, my great indebtedness for their uniformly interested and satisfactory services rendered during the year.

ST. CATHARINES.

DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF BEES

FOR THE

Fiscal Year Ending March 31, 1915

PREPARED BY

The Apiarist, Dominion Experimental Farms	F. W. L. Sladen.
Superintendent:—	
Experimental Station, Charlottetown, P.E.I.	J. A. Clark, B.S.A.
Experimental Farm, Napan, N.S.	W. W. Baird, B.S.A.
Experimental Station, Kentville, N.S.	W. S. Blair.
Experimental Station, Fredericton, N.B.	W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, Que.	Jos. Bégin.
Experimental Station, Cap Rouge, Que.	Gus. Langelier.
Experimental Farm, Brandon, Man.	W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask.	T. J. Harrison, B.S.A.
Experimental Station, Lethbridge, Alta.	W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta.	G. H. Hutton, B.S.A.
Experimental Station, Invermere, B.C.	G. E. Parham.
Experimental Farm, Agassiz, B.C.	P. H. Moore, B.S.A.
Experimental Station, Sidney, B.C.	L. Stevenson, B.S.A., M.S.

REPORT FROM THE BEE DIVISION

OTTAWA, March 31, 1915.

J. H. GRISDALE, Esq., B. Agr.,
Director, Dominion Experimental Farms,
Ottawa.

SIR, I have the honour to submit herewith the first report of the Bee Division. The Bee Division came into existence at the separation of the Division of Entomology from the Dominion Experimental Farms on April 1, 1914.

Included herewith will be found the report of the work at the Central Experimental Farm and the reports that have been rendered by the Superintendents of the thirteen branch Experimental Farms and Stations at which bees were kept in 1914, viz.: Charlottetown, P.E.I.; Nappan, N.S.; Kentville, N.S.; Fredericton, N.B.; Ste. Anne de la Pocatiere, Que.; Cap Rouge, Que; Brandon, Man.; Indian Head, Sask.; Lethbridge, Alta.; Lacombe, Alta.; Invermere, B.C., Agassiz, B.C., and Sidney, B.C.

It seems best to commence this first separate report on apiculture by touching upon the principal questions and problems that confront successful bee-keeping in Canada, and showing in what way a start is being made to contribute towards their solution. It has been demonstrated that bees can be kept at all the above-mentioned Farms and Stations, though losses of bees, sometimes heavy, have occurred during the winter. Swarming has also been a frequent cause of loss, not only by swarms flying away, but by its weakening the colonies and thereby predisposing to winter losses. Swarming, too, greatly curtails the output of honey. But losses during winter and as a result of swarming are not expected to offer specially serious difficulties at any of the branch Farms because undoubtedly they may be much reduced by careful methods of management adapted to local conditions. Experimenting with various methods of wintering and of controlling swarming is, therefore, being made an important part of the experimental work at the Central Farm and also on the branch Farms and Stations.

A considerable measure of success having attended the wintering of bees out-of-doors at Ottawa in cases packed with insulating material, and sheltered from wind, this method has been tried at several of the other Farms where bees have, up to the present, been wintered only in cellars. The results as shown in the reports from Ste. Anne de la Pocatiere, Que.; Charlottetown, P.E.I.; Fredericton, N.B.; Brandon, Man., and Invermere, B.C., are interesting and warrant a further trial of this method of wintering. In the notes upon wintering attention may be drawn to the satisfactory results following good ventilation of the cellar at Lacombe and to the loss caused by unwholesome stores at Ottawa and Nappan.

It may be remarked that the commonest cause of the death of colonies of bees in winter in most apiaries is starvation, due to neglect to supplement insufficient winter stores with well-made sugar syrup at the end of September, and that the colonies that survive are weakened by losses due to various causes. To estimate the extent of these losses it is not enough to weigh the colonies in autumn and spring, because the weight lost during the winter is principally in stores. Each colony should be examined at the first favourable opportunity in the spring, and the number

of combs fairly well covered by bees when the temperature of the air outside is not far from 60° should be noted. In this way a surprising shrinkage in the population of the apiary amounting perhaps to 50, 60 or even 70 per cent, will often be discovered.

It having been ascertained that bees can be kept at the branch Farms, the principal question that arises is—What profit may be expected from the bees, taking one season with another? The profits must necessarily depend upon the available nectar within easy distance of the apiary, that is, within one to one and one-half miles. The amount of available nectar depends, in its turn, not only upon the presence in abundance of nectar-secreting flowers but upon favourable weather for secretion and for the flight of bees, and upon the nectar being within reach of the tongue of the honey-bee, which is considerably shorter than that of the bumble-bee.

In order to analyse the honey yields, several of the colonies at the Central Farm and one at each of the branch Farms having bees, are kept on scales during the season, and the daily increase, or loss, of weight is recorded. When there is found to be an increase of weight, observations are made in the neighbourhood to ascertain from what plants the bees are gathering the honey, and samples are taken from the hives from time to time to test the quality of the honey.

Investigation has shown that, except possibly on the Farms on the prairie and in the dry belt of British Columbia, the bulk of the surplus honey is generally gathered from less than half-a-dozen species of plants, and in some cases from only two or three, and that the quality of the honey obtained from these plants is excellent.

The question as to the best kind of bee to keep is also being studied. In Eastern Canada the bee of the country is a black bee; on the prairie and in British Columbia it is often a hybrid between a black bee and an Italian. A change to Italian bees at the Central Experimental Farm in 1910, made primarily in order to control the disease of European foul brood, a bad outbreak of which had occurred in this apiary, has resulted, not only in the suppression of the disease, but in a substantial increase of the honey crop.

In 1914 Italian queens were introduced into some of the colonies in several of the apiaries on the branch Farms. This will enable a comparison to be made between the Italian bee and the bee of the country in different localities.

In the summer of 1914 I visited the branch Experimental Farms and Stations and inspected their apiaries, made a preliminary survey of the conditions for bee-keeping in the regions served by the Farms, met some of the Provincial bee inspectors and visited the apiaries of several prominent bee-keepers located near the Farms.

The Experimental Farm at Brandon, Man., was visited on June 25. The apiary here contained thirty colonies in 8-frame hives, all of which except two were nuclei which had just been formed with young queens reared at the Farm. They were in thriving condition.

The Experimental Farm at Indian Head, Sask., was next visited, and arrangements were made for re-stocking the apiary, which recently had died out, with bees from Brandon.

At the Lethbridge Experimental Station, visited on June 29, the bees had commenced storing honey from alfalfa. As will be seen from Mr. Fairfield's report, one hundred pounds of honey, nearly all of which was believed to have been gathered from this source, were taken during the season from the only strong colony. This result is particularly interesting and encouraging, as alfalfa does not produce honey in marketable quantities in the east, and the work of the bees at Lethbridge is hampered by high winds.

The Experimental Station at Invermere was visited on June 30. In this region fair honey yields have been obtained from various sources, and the value, if any, of alsike clover for honey production when grown under irrigation is under investiga-

tion. Unfortunately, the three colonies at the Station were not in good enough condition to take full advantage of any honey flow.

The Experimental Station at Sidney, B.C., visited on July 7, had fourteen colonies. Good success had attended the production of extracted honey, but the colonies worked for comb honey had mostly swarmed, leaving the work in the supers only just begun.

The Experimental Farm at Agassiz, visited July 8, had nine colonies in 10-frame hives. Several swarms had evidently been lost, though plenty of room had been given. At both Sidney and Agassiz the principal source of honey is evidently white clover, fireweed being perhaps next in importance.

The Experimental Station at Lacombe, which was next visited, had recently re-started its apiary with two colonies, which were doing well. Tracts of white clover were seen at Lacombe, Innisfail and Edmonton, but on the drier parts of the prairie clover fails.

The next Stations visited were those at Scott, Sask., and Rosthern, Sask. Bees have not yet been tried at either of these Stations. Rosthern, however, seems to have sufficient wild flowers to produce a crop of honey; indeed, a fairly successful apiary was located for several years in the neighbourhood. Much evidence was gathered to show that, on the prairie, the timber and scrub lands will produce more honey than the bare prairie, except where alfalfa proves valuable.

The Experimental Farm at Nappan, N.S., with eight colonies; the Station at Kentville, N.S., with eight colonies; the Station at Charlottetown, P.E.I., with nine colonies; the Station at Fredericton, N.B., with seven colonies; the Station at Ste. Anne de la Pocatiere, Que., with fifty-one colonies and the Station at Cap Rouge, Que., with twenty colonies, were visited between July 27 and August 11. At each of these Farms and Stations a considerable quantity of surplus honey had been gathered from alsike and white clover, with the exception of Nappan, N.S., where much clover had been winter-killed. The general opinion gleaned from the visit to the Eastern Provinces was that they offer a very promising field for the extension of profitable bee-keeping, which is much neglected, especially in the Maritime Provinces where both white clover and alsike clover are often abundant in many places, and the climate seldom fails to supply the right amount of moisture and heat to insure a valuable honey crop from these or from other sources.

At most of the branch Farms and Stations the apiary adjoins the poultry yard, and the bees are being looked after by the man in charge of the poultry. Each well-established apiary contains a portable and bee-proof wooden building about fourteen feet long by twelve feet wide in which the material is prepared, the honey extracted and appliances are kept.

The bees at all the branch Farms were found to be free from foul brood. However, an apiary three miles from the Kentville Experimental Station, visited on July 31, 1914, was found to be badly affected with American foul brood. The presence of this serious disease in this district had been hitherto unknown. At the Central Experimental Farm no trace of European foul brood, which had been found in 41 per cent of the colonies in 1913, could be detected in 1914.

A co-operative experiment with Mr. J. Martineau, a bee-keeper located at Montcerf, Que., has been commenced in order to investigate conditions for bee-keeping in northwestern Quebec where, on account of the rocky nature of the country, but little cultivation is possible and the bees have to depend principally upon wild flowers. Chief among these wild flowers is the willow-herb or fireweed (*Epilobium angustifolium*) which grows in forest clearings throughout Canada and is apt to be particularly plentiful after devastation by fire. Being but little affected by drought, this plant is said seldom to fail to give a good crop of honey. The honey from the fireweed, as produced in Eastern Canada, is nearly water-white and has a very mild and agreeable flavour.

OTTAWA

In 1914, from 128 colonies of Italian bees, spring count, after purchasing from Louisiana in May 262 queens at a cost of $170.30, Mr. Martineau obtained 33,800 pounds of honey which sold for $3,594.50, and increased his apiary to 306 colonies. About 21,800 pounds of the honey were gathered between July 8 and August 30, and came almost entirely from fireweed. The remainder, roughly 12,000 pounds, was gathered during a period of very fine weather between September 11 and 22, principally from aster, and probably a little from the late-flowering species of goldenrod. The September honey-flow did not occur in the two previous years and was, therefore, unexpected. The aster honey proved to be of a light amber colour, of pleasant flavour and not unwholesome for the wintering of bees, not granulating in the combs. The species of aster from which this honey was gathered is one that grows in dry places, the flowers being of a pale blue colour. It belongs to *Aster cordifolius* group. The average honey yield per colony for the whole season, spring count, was 264 pounds. A strong colony on scales totaled 507½ pounds for the season. These figures give some idea of the vast amount of honey annually going to waste in Canada for want of bees to gather it.

I attended the Annual Convention of the Quebec Bee-keeper's Association held at Montreal on November 11, and the Annual Convention of the Ontario Bee-keeper's Association held at Toronto on November 12 and 13, and delivered an address at each meeting upon the rearing of queen-bees. I also attended the Apicultural Short Course held at Guelph, Ont., in January, 1915, and gave lectures there.

Mr. Geo. F. Kingsmill, B.S.A., was appointed Assistant in the Bee Division from June 29 to December 29, and rendered much valuable service. He resigned to join the staff of the Ontario Agricultural College. Mr. Kingsmill attended the Convention of the New Brunswick Bee-keeper's Association held at St. John, N.B., on September 10.

During the present year Exhibition Circular No. 18 entitled "Bee-keeping in Canada" has been prepared and issued.

Between April 1, 1914, and March 31, 1915, 843 letters were received in this Division and 844 were dispatched.

I have the honour to be, sir,
Your obedient servant,

F. W. L. SLADEN,
Apiarist.

OTTAWA.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE APIARIST, F. W. L. SLADEN.

SUMMARY OF WINTERING RESULTS, 1913-14.

As in previous years, the cellar used for wintering the bees was the one that had been prepared and fitted up for this purpose under the Farm Foreman's house, as described in the Annual Report for 1904.

Thirty-seven colonies were placed in the cellar on November 10, 1913, and sixteen were left out-of-doors. The colonies wintered outside were, as in the previous winter, put into cases each holding four hives, but they were all packed with shavings. The shavings on the top of the hives were placed in bags for easy removal. The bees were wintered in a portion of the apiary around which had been erected a board fence about seven feet high to protect them from wind. During the winter the entrances of the wintering cases were reduced to 1¼ inches high by three-eighths of an inch wide. These entrances were on several occasions buried under fresh falls of powdery snow.

The bees were removed from the cellar on April 14 and 16. In an examination of all the colonies made on April 24 to 28 it was found that none had died, and that the bees that had wintered out of doors were on the average stronger than those that had wintered in the cellar, and had also commenced breeding earlier than the latter. They covered, on an average, 4·6 combs, while those that had wintered in the cellar covered, on the average, 3·6 combs. The bees wintered just as well in two cases which had only 2½ inches to 3 inches of shavings around the sides of and beneath the hives, with bags of shavings nine inches thick on top, as in the other two cases which had five to six inches of shavings around the sides and at the bottom and twelve inches on top.

Very few bees died in the snow. The last good flight before winter was on November 22 (temperature 63°, bright sunshine, light wind). The first extensive spring flight was on March 16 (temperature 50°, bright sunshine, no wind, and snow still on the ground). This may be considered a good test of outdoor wintering in a cold winter, as February was a very cold month.

The outdoor wintered colonies were left in their wintering cases until June, and it was noticed that they built up more rapidly than those that had been been brought out of the cellar and set out in the apiary without protection.

The rather poor results from the cellar wintering seemed to be partly due to the temperature of the cellar being too variable, combined with insufficient ventilation. The temperature dropped to 37° in the below zero weather in February, with the chimney ventilator partly closed. The highest temperature recorded in the cellar was 54° on April 11, with all three ventilators open, but a draught of air passing through the cellar (a gale was blowing outside) the bees were quiet. Both the outdoor and indoor wintered colonies that contained a good proportion of young bees had less winter loss than those that contained chiefly old bees. The average loss of weight of the hives in the cellar was 14·4 pounds, the greatest loss 27 pounds. The average loss of weight of hives outside was 22½ pounds, greatest loss 35 pounds.

The first half of April was cold and the bees outside did not get much opportunity for flight until the others were brought out of the cellar on the 16th. From that time forward the weather gradually warmed up.

HONEY CROP, 1914.

Warm weather during the latter half of May resulted in a honey-flow from dandelion, of which full advantage was taken by three strong colonies in the wintering cases, each of which had filled a super of shallow frames with honey, principally from this source, by June 2. None of the cellar wintered colonies stored in the super more than a few pounds of this early honey.

The first heads of alsike and white clover were seen on May 26, but the colonies on scales did not begin to increase in weight rapidly until June 19 when a few showers appeared to increase greatly the secretion from these two plants. A heavy honey-flow from this source continued with but little interruption until July 21. From this date the supers continued to fill slowly until August 22.

The total honey crop was 2,348 pounds of extracted honey and 69 sections of comb honey. The extracted honey consisted of 120 pounds of dandelion honey gathered in May, 1,675 pounds of white honey gathered during June and July, and 553 pounds of amber-coloured honey gathered at the end of July and in August. There was only a trace of the flavour of buckwheat honey in the amber honey.

The largest yield from a single colony was 257 pounds of extracted honey. This was a colony that had wintered outside. The mother of the colony was a daughter of a queen imported from Italy, mated the previous summer with a drone of the local black variety at the Kazabazua mating station. The bees of this colony were unpleasant to handle on account of their irascible disposition.

During the latter part of September, in the early mornings, the bees were observed to be busily gathering honey-dew from an avenue of birch trees near the apiary.

The following table gives the average loss or gain in weight of a colony on scales during successive periods of about ten days during the season, with the principal source from which the honey was gathered:—

Period.	Loss.	Gain.	Principal Source of Honey.
	Lb.	Lb.	
April 20 to 30	1·2	....	
" 30 to May 11	....	1·1	Willow.
May 11 to 21	....	8·4	Dandelion and fruit bloom.
" 21 to 30	....	12·8	" "
June 1 to 9	3·2	....	
" 9 to 19	....	6·5	Alsike and white clover.
" 19 to 30	....	30·8	" "
" 30 to July 11	....	12·3	" "
July 11 to 21	....	39·3	" sweet clover.
" 21 to August 1	....	23·7	" "
August 1 to 10	....	5·0	Sweet clover and goldenrod.
" 10 to 22	....	4·7	Goldenrod and aster.
" 22 to September 2	....	0·7	" "
September 2 to 12	4·5	....	
" 12 to 20	....	3·3	Aster and honey-dew.

A larger crop of honey would have been secured, but for an epidemic of swarming which occurred during the clover honey flow. The honey sold quickly at the following prices: Extracted, white, in 5-pound and 10-pound tin pails, 15 cents per pound; amber, ditto, 12 cents per pound; comb honey, 20 cents per section.

OTTAWA.

SUMMARY OF WINTERING, 1914-15.

Forty colonies were brought into the cellar on November 18, 1914, and twenty-four were left outside and packed in shavings, as in the previous winter, in wintering cases each holding four colonies.

The bees were brought out of the cellar April 7, and all the colonies in the apiary were weighed and examined between that date and April 15. Three cellar-wintered colonies had died and the rest covered, on the average, only three combs. Three colonies wintered outside had died, and the rest covered, on the average, only 2·4 combs.

There was good evidence to show that the unusually heavy loss of bee life in the cellar was associated with granulated and unwholesome stores and also with symptoms of thirst. The cappings over the stores of the colonies that lost most heavily had been extensively torn open by the bees, and the stores were found to be either granulated or of dense consistency. Moreover, the bees took the first opportunity after being brought out of the cellar to flock in large numbers to the edge of the melting snow in the apiary and suck up the water. The cellar was dry, there being no sign of mould in the combs removed from it. The colonies whose natural stores were supplemented with a considerable proportion of sugar syrup suffered, on the average, somewhat less than those in which the proportion of syrup was smaller. This syrup was made in the usual way from two parts by measure of sugar and one of water. The consumption of food during the winter was heavy and varied in proportion to the mortality. This is well shown in the following table:—

ANALYSIS OF CELLAR-WINTERED COLONIES.

	Number of colonies.	Average loss of weight per colony. Pounds.
Dead	3	28
Bees covering up to one comb	2	21
Bees covering over one comb up to three combs	16	20
Bees covering over three combs up to five combs	12	16
Bees covering over five combs up to six combs	7	14

The granulated and unwholesome stores probably came from aster, several white-flowered species of which, belonging to the *Aster tradescanti* group, were much visited by the bees during the latter part of August and in September, and also from honey-dew.

The still heavier loss in the colonies wintered outside is less easy to explain. Fewer torn open cells were found in these hives. There was, however, a considerable amount of granulated stores which, probably, were the principal cause of the loss. It should be noted in this connection that the air at Ottawa in winter is extremely dry. Queenlessness, due to special manipulation in the autumn, was also responsible for some of the loss. The colonies packed in the larger cases with an extra amount of packing material again showed no advantage over those having only 2½ inches of packing material around the sides and beneath.

The bees had partial flights on November 1 (temperature 64·6°, cloudy and high wind) and on November 26 (temperature 45°, cloudy). The first good spring flight was on March 23 (temperature 45·5°, bright sun but little wind).

BEE-BREEDING EXPERIMENT.

The immediate objects of this experiment are (1) to discover a practicable way of controlling mating and (2) to find out if the non-swarming character noticeable in certain colonies of bees is inherited. Should it be found that this character is inherited it is hoped that it may be possible to produce a variety of bee that swarms but little, so that bee-keepers may be saved the great amount of labour and loss incidental to swarming.

OTTAWA.

Some ground for expecting that disinclination to swarm may be inherited is found in the fact that certain races of bees, notoriously Carniolans, are more prone to swarm than others, and many successful bee-keepers believe that by breeding from non-swarming colonies they have reduced swarming in their apiaries.

The prompt mating of queens by local drones at the mating station that had been established on the Kazabazua Plains, Quebec, in 1913, within three miles of which no colonies could be found, indicated that the elimination of mating by local drones was probably impossible. Consequently, it was decided to defer the mating this year until the autumn after most of the local black drones around the mating station had been turned out of their colonies to die, so that the proportion of mismated queens might be reduced to a minimum. In September, therefore, queens and drones were bred from a colony of Italian bees that had made no preparation for swarming either in 1913 when, during the time of dandelion and fruit bloom, about 80 per cent of the colonies in the apiary were found to have queen cells containing eggs and larvae, nor in 1914 when, during the time of clover bloom, about 80 per cent of the colonies had swarmed. These queens and drones were taken to the mating station, and a number of the queens were successfully mated during the first week in October. Fourteen of these queens were successfully introduced to colonies in the apiary at Ottawa, and will form the subject of further investigation.

TYPE OF HIVE USED AT THE CENTRAL EXPERIMENTAL FARM.

In order to make a fair comparison of the work of the different colonies of bees at the Central Experimental Farm, it has been decided to adopt a uniform type of hive.

The majority of the hives are 8-frame Langstroth hives of various patterns. The remainder are 10-frame Langstroth hives. Experience has shown that the 8-frame brood chamber does not supply sufficient breeding space; the first super that is given must therefore, be employed largely for brood rearing or swarming will be very likely to take place. But a 10-frame brood chamber is usually large enough to accommodate all, or nearly all, of the brood; in consequence, the super may be employed for the storage of surplus honey, the queen being excluded from it early in the honey flow, or prevented from entering it altogether, by means of a perforated metal queen excluder. For this reason principally it has been decided to adopt the 10-frame size and to discard the 8-frame hives.

A supply of 10-frame hives each consisting of the following parts have been put together in the winter of 1914-15 in readiness for the bees to be transferred to them in the spring: (1) Wooden stand; (2) Floor, providing five-eighths inch space under the frames; (3) Brood chamber to take ten Langstroth-Hoffman frames and a division board; (4) Three extracting supers—some of these supers take Langstroth frames unspaced, others are shallow, taking frames only 5⅜ inches deep (a comb-honey super was furnished with a few of the hives in place of one of the extracting supers); (5) Telescope cover, with packing material between the sheet metal top and boarded interior.

This outfit is also a very satisfactory one for the practical bee-keeper, except that in regions where a large honey crop is expected the full-depth extracting supers may be used exclusively. The extracting of the honey is done more expeditiously by the use of the larger combs, and should the brood chamber become overcrowded with brood a comb or two can be removed and placed in the super from time to time. This is only one of several advantages that follow having brood chambers and supers of the same size and interchangeable. The shallow supers are employed in our experimental work, because the amount of super room given is under better control, and the bees will enter and occupy the supers more readily in spring.

OTTAWA.

EXPERIMENTAL STATION, CHARLOTTETOWN, P. E. I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

Two lots of bees were obtained when the apiary was started at the Experimental Station in 1913, namely: Italian bees purchased locally and Black bees purchased at Bridgetown, N.S. The bees from Nova Scotia were very badly damaged in shipment, and several colonies had to be united, Italian queens being introduced into all but one. Five colonies were placed in the cellar of the superintendent's residence on December 18, 1913, and they were brought out on April 27. The bee-cellar was well ventilated, had a cement floor and the temperature remained fairly constant around 45° F. The hives had the top and bottom boards removed and were placed on 2-inch by 4-inch skids and covered with four thicknesses of bran sacks. The colonies all came out strong and in good condition in the spring of 1914.

During the summer of 1914 great difficulty was experienced in controlling swarming. Four swarms were successfully hived, but a swarm of black bees escaped.

About 100 pounds of surplus honey were extracted and a small quantity of comb honey was obtained. White clover and alsike clover are the principal sources of honey here. The clover honey was of extra fine quality and very pale. During the first week in August the bees were observed in great numbers on the English lime or linden trees that are very numerous about the city of Charlottetown. The honey from this source had a distinct, peculiar flavour.

In October, 1914, a four-colony wintering case was made and the four heaviest colonies were packed in it. The covers were removed and sacks filled with shavings placed over the hives. Around the sides, on the bottom and over everything, from four to six inches of shavings were packed close. An entrance, with sliding cover to reduce its size, was made for each colony. The two colonies on the east side wintered fairly satisfactorily, but the two on the west side, which was more exposed, died, leaving large stores of honey.

Five colonies of bees were placed in the bee-cellar, described above, on November 14, 1914. The weather was extreme and the temperature of the cellar varied from 40° to 58° F., causing a considerable restlessness among the bees. When the hives were removed from the cellar in the spring three of the colonies were found to be in good condition. The two remaining hives contained no bees, but abundant stores of honey. The number of dead bees on the cellar floor did not seem to be abnormal.

Colony.	Wintered.	Weight. November 14, 1914.	Weight. April 22, 1915.	Remarks on Condition. April 22, 1915.
		Lb.	Lb.	
No. 1	Outside	73½	48½	Fairly good.
No. 2	"	70½	49	Strong.
No. 3	"	66	43	Dead.
No. 4	"	67	38	Dead.
No. 5	Cellar	69	48	Strong.
No. 6	"	68½	48	Good.
No. 7	"	67½	53	Fairly good.
No. 8	"	66½	55	Dead.
No. 9	"	67	39	Dead.

Eight-frame Langstroth hives were used during the season of 1913, and again in 1914. 10-frame Langstroth hives have been secured and they will be used in comparison with the smaller hive for both summer and winter experiments with bees.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

In Nova Scotia many phases of bee-keeping are still in the experimental stage. When the problems connected with these are worked out, a greater interest will, doubtless, be taken in the industry, which has been found to be most profitable. Many have been deterred from keeping bees by the fear of losing them in the winter, the care of the bees in winter and spring being a serious problem in this locality, and one that is the subject of much discussion. In the spring the prevailing north-east winds which blow from the fields of ice, always found in the Straits at that period of the year, bring a great deal of unfavourable weather about the time when it is necessary to bring the bees out of the cellar. There is, however, this to be said, they can be left outside later in the fall than in many places in the interior provinces, due to the fact that water cools more slowly than land. The warm breezes from the sea at this time of the year keep the weather mild until quite late in the fall. For instance, in 1914, our bees had a flight as late as December 2, and were not housed until the 15th.

Black bees are kept at this Farm, these having so far proved somewhat more hardy than Italians under the weather conditions of this region.

Wintering Results, 1913-14.—During the fall of 1913-14 nine strong colonies were placed in the bee-cellar, which is in the Superintendent's house, but partitioned off from the main cellar. Sufficient natural stores were left in the hives for them during the winter. The temperature of the cellar ranged from 45° to 50°. The floor consisted of planks placed on the top of the earth.

When the bees were taken out on April 24, 1914, they were in bad condition, due to the fact that mice had entered the hives during the winter and eaten part of the stores, and only five colonies were found to be living.

Honey Production.—The following is the production of the nine colonies during 1913 and the five colonies during 1914:—

Yield from nine Colonies of Bees for Season of 1913.

1,170 pounds extracted honey at 12 cents (wholesale price)	$ 141 40
Nine swarms worth, say, $5 each	45 00
Total	$ 186 40
Average value of produce per colony	20 71
Average weight of honey per colony	130 pounds.

Yield from five Colonies of Bees for Season of 1914.

550 pounds extracted honey at 12 cents (wholesale price)	$ 66 00
Three swarms worth, say, $5 each	15 00
Total	$ 81 00
Average value of produce per colony	16 20
Average weight of honey per colony	110 pounds.

The season of 1913 was much better in every respect than that of 1914. The spring was earlier and there was an abundance of alsike and white clover, our best nectar-producing plants. In 1914, clover throughout this district was nearly all winter killed. The spring was very late and the greater part of the season extremely cool. Only 50 pounds of honey were extracted previous to August 1, and practically all the honey was of second quality.

The estimated relative quantities of the different kinds of honey produced in 1914 were as follows,—blueberry, 25 pounds; dandelion, 25 pounds; white clover, 50 pounds; buckwheat, 50 pounds; goldenrod, 350 pounds; and wild aster, 50 pounds.

Winter results, 1914-15.—A cement floor was laid in the cellar and, in order to protect the bees from mice, a table with legs of piping $2\frac{1}{2}$ feet high was made to receive the hives. This afforded good protection from mice.

The eight colonies were divided into three lots and prepared as follows:—

Lot 1 consisted of four colonies from which the honey was taken away and artificial stores consisting of two parts of good granulated sugar to one part of water were substituted, the syrup being fed to them through a Miller feeder.

Lot 2 consisted of two colonies, which received partly natural and partly artificial stores, the latter being the same as fed to Lot 1. The frames containing the natural stores were placed at either side of the brood chamber, leaving the centre frames to be filled with artificial stores.

Lot 3 consisted of two colonies with natural stores only.

The natural stores came principally from goldenrod, possibly a little from wild aster.

The result of this experiment was striking.

Lot 1 came through the winter in excellent condition. The cluster was not broken and the bees did not show any signs of either restlessness or dysentery, but they consumed the greatest amount of stores.

Lot 2 showed slight signs of restlessness and dysentery, but the cluster was not broken. They consumed slightly less stores than did Lot 1.

Lot 3 did not winter nearly so well as either Lot 1 or 2, showing a greater degree of restlessness and dysentery, with the cluster much broken, but they consumed the least amount of stores.

This result corroborates the opinion of other bee-keepers in this section who have had best results from wintering bees on artificial stores alone. However, the experiment will be repeated in order to endeavour to get more conclusive results.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. SAXBY BLAIR.

Four colonies of black bees in 8-frame hives were wintered outside by giving to each a protection of four inches of planer-mill shavings, which were filled in between the hive and a casing four inches larger all round than the hive, and to a depth of eight inches over the top of the hive. To keep the shavings dry there was a water-tight cover in which openings were left for ventilation.

The hives weighed, when put into winter quarters, and when removed, as follows:

Colony.	December 13, 1913. Weight of Hive.	April 13, 1914. Weight of Hive.
	Lb.	Lb.
No. 1	67	56
No. 2	61	48
No. 3	51	41
No. 4	66	51

When examined in the spring the colonies were only fairly strong, but had a considerable quantity of stores. Toward the middle of May, No. 3 hive was given some sugar syrup, but otherwise no feeding was done.

We had an increase of four swarms. Two weak swarms were, on July 31, united with the two weak and queenless colonies, which left us six fairly strong colonies for wintering.

The season was not very favourable for honey, owing to the clover plants having been killed out almost entirely the previous winter. The honey gathered was principally from wild radish, goldenrod and fireweed. Thirty pounds was the most extracted from one hive. The total product was 135 pounds of extracted honey.

The six colonies were wintered outside in cases. In place of using one case to a hive as last winter, two hives were placed together in one case with a space of two inches around the sides for planer shavings. The top was protected with 8 inches of shavings. Openings were left in the cover for air. An examination on April 13 indicated that the colonies had passed the winter in good condition.

—	Weight Nov. 6, 1914.	Weight April 13, 1915.	Condition April 13, 1915.
	Lb.	Lb.	
Colony No. 1	68	50	Bees covered 6¾ combs. Brood in all stages.
" 2	70	51½	Bees covered 5½ combs. A little brood.
" 4	63½	46	Bees covered 4 combs. No brood.
" 6	66	44½	Bees covered 5 combs. A little brood.
" 7	65¾	48	Bees covered 5½ combs. Brood in all stages.
" 8	68	54	Bees covered 5 combs. Very little brood.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

On June 9, 1914, an apiary was started with five colonies of black bees in 8-frame Langstroth hives. The season was cold and backward, consequently, they did not do as well as might be expected in a normal season.

No. 4 threw a swarm on July 20 and No. 5 on July 28. The swarms were hived in 8-frame Langstroth hives. On September 9 their queens were destroyed and a day later imported Italian queens were successfully introduced by the smoke method.

An observation hive was fitted up with a comb containing brood in all stages covered with bees, one shallow frame three-quarters filled and three sections in various stages. This was sent, together with sample bottles of honey, to the Dominion Experimental Farms Exhibit at the St. John Exhibition held in September and, from the number of inquiries made as to the cost of starting one or two hives and the methods of management, it would seem to have fulfilled a useful purpose.

The principal honey plants in this district are dandelion, wild raspberry, alsike, fireweed, buckwheat, goldenrod and aster.

The total production of honey for the season was 147 pounds extracted honey and 59 sections.

Two winter cases to hold four hives each were constructed in accordance with Mr. Sladen's directions, and the seven colonies were put into these on November 11 and snugly packed with planer shavings. The cases were protected on three sides by a close board wind screen.

On November 11 the hives were put into the winter cases, each having plenty of stores for consumption during the winter.

An examination of the hives on April 15 showed that the bees had come through the winter in excellent condition, with the exception of those in hive No. 3 which were queenless and nearly all dead. Breeding was fairly advanced, brood in all stages being found in each of the six hives.

The following table shows the results obtained:—

Hive.	Extracted Honey.	Comb Honey in 1 pound sections.	Weight of hives April 15	Bees covered April 15.
	Lb.		Lb.	
No. 1	66	....	56·0	6 frames.
" 2	20	23	55·0	4 "
" 3	31	....	49·0	Queenless and nearly all dead.
" 4	12	24	56·5	5 frames.
" 5	18	12	54·0	4 "
" 6*	....	....	54·5	5 "
" 7*	....	....	47·0	5 "

* Nos. 6 and 7 were late swarms.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

Six colonies of the black bee of the country were acquired in June, 1913, to start the apiary at this Station. Seven natural swarms from these gave us thirteen good colonies for wintering. They were placed in a dry, well-ventilated cellar on November 20, and were brought out on April 20, 1914, when it was found that twelve had wintered very well and one was weak.

May was a favourable month for the bees, but vegetation was so backward that the willows were not in flower until the first of the month and they remained in bloom until the fifteenth. Dandelion was in flower on June 2, but from this date the weather became cold and rainy and remained so until nearly the end of the month; consequently, the bees gathered no surplus honey in the early part of the season. During the last days of June the fine weather returned and the bees worked actively on the wild flowers on the northern slopes of the mountains. A flow of very good honey from alsike clover followed. The alsike lasted only from June 28 to July 18. A drought, which proved very disastrous to honey-producing plants, began at the end of June and continued until the end of August. In consequence of this drought buckwheat produced only very little honey and remained in flower but a short time.

The twenty-four colonies of which our apiary consisted on June 20 gave us thirteen first swarms and eleven second swarms. Besides these, eight artificial swarms were made. Eight colonies were united to make all strong for wintering. The honey crop amounted to 364 pounds of extracted honey and 108 sections. The honey was of the best quality, the colour being white and the flavour particularly fine. The average price obtained was 20 cents per pound. The greatest yield from a single colony was 68 pounds, the smallest 14 pounds.

Forty colonies were put into winter quarters in the cellar, and four were left in the apiary and placed in a wooden case consisting of tongued and grooved boards in the form of portable panels hooked together so that they could be removed and stored in a shed for the season. Three inches of oat chaff were placed between the hives and the panels and also underneath, and nine inches of the same material were placed in bags on top of the hives under the cover.

The average temperature of the bee-cellar during winter was 43° F. but, unfortunately, a heavy rain in January flooded the cellar with twelve inches of water, and the temperature fell to 33° F. The water disappeared in twenty-four hours, but the cellar remained cold and damp and the bees became uneasy. Additional ventilation was immediately given and conditions soon became normal again, so that it is thought that the bees did not suffer much from this accident. The winter was rather mild and the bees outside flew freely for a short while on January 7 in a temperature of 47·4° F.

The bees were removed from the cellar on April 14, 1915. The hives showed an average loss of weight during the winter of 16½ pounds each. Those wintered out-of-doors showed an average loss of 10½ pounds. The first examination of the colonies was made on May 8-10. Of those wintered in the cellar 80 per cent were in good condition with two to four frames of brood, 15 per cent in fair condition with a little brood and 5 per cent weak, without brood. The four colonies wintered outside were all in good condition with brood in three to five frames.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

Races kept.—Two races of bees are kept at this Station, Blacks and Italians.

Hives.—The hives used are all 10-frame Langstroth.

Bee-cellar.—The cellar is under the Superintendent's house. It is 19 feet 8 inches long by 9 feet 6 inches wide and 6 feet high. The floor is of concrete, the walls and ceiling are double with a three-inch space filled with shavings. The ventilation is of the Rutherford type. The temperature ranged from 41° to 52° F. in 1913-14, and from 38° to 56° in 1914-15. Three thermometers, at the ceiling, half way down and near the floor, showed a difference of from 2° to 3°. There are no mice in the cellar.

Wintering results 1913-14.—On November 10, 1913, after three days of mild weather, eleven colonies of common black bees, all in excellent condition, were placed in the cellar. The average weight per hive was 74·66 pounds and they ranged from 67·5 to 83·5 pounds. When taken out of the cellar on April 20 the eleven colonies seemed to be in excellent condition with the exception of one which was affected with dysentery. After uniting there were nine left. The average weight when taken out was 62·01 pounds, a loss during the winter of 12·65 pounds.

Honey produced in 1914.—The total production of honey was 334 pounds and the average per colony, spring count, was 37 pounds. The greatest yield from a single colony was 72 pounds.

Wintering results, 1914-15.—On November 14, 1914, sixteen colonies, three of Blacks and thirteen of Italians, were placed in the cellar. The average weight per hive was 63·6 pounds and they ranged from 56 to 76 pounds. Fifteen colonies were taken out alive on April 21. The average weight was 46 pounds, a loss of 17·6 pounds during the winter. The average number of combs covered by bees on April 26 was 4½.

Colour and flavour of honey.—A sample of honey was sent to the Apiarist, Central Experimental Farm, Ottawa, on November 4, 1914, and Mr. Sladen reported as follows: "The colour is rather too dark and the flavour too pronounced for pure clover honey. In all probability it is clover honey with a small admixture of honey from various plants growing in the swamp near the Station. The flavour is quite pleasant and attractive and the honey is of good consistency."

Bee pasturage.—Bee pasturage is limited because the Station is situated on the banks of the St. Lawrence river which is nearly two miles wide at that spot, so that the territory covered is only half of what it should be. White clover is not sown by anybody near the farm. It grows wild along roads and on waste lands and we are now putting in two pounds per acre in all mixtures; the first flowers in 1914 appeared about June 15. Alsike clover is sown each year on the farm and is an important factor in the yield of honey; it generally comes in bloom about ten days after white clover. Dandelion grows in profusion in the district surrounding the Station and generally flowers from May 20 to June 25. About a couple of acres of buckwheat will be grown each year, beginning with 1915.

Investigations.—During the winter of 1913-14 we had in the cellar five hives with the covers on, raised about one-eighth inch at one end, and six hives over which, instead of covers, there were four layers of coarse sacking. The average loss in weight during winter for the five hives with covers was 12·5 pounds, whilst it was 12·79 pounds for the six where the coarse sacking replaced the covers. It is evident that, under these circumstances, and for that winter, there was no difference between the two ways of covering the hives.

The same experiment was tried during the winter of 1914-15. Eleven hives with the ordinary covers on lost, on an average, 19·8 pounds, while the five with the coarse sacking lost 21·6 pounds. There did not seem to be any difference, just as in 1913-14.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

The season of 1914 was started with fifteen colonies in 8-frame hives which were taken from the basement of the Superintendent's residence on April 13. Twenty had been put away for the winter but five of these died, probably from lack of stores. The average weight, on November 1, 1913, of the five that died was 38 pounds, and of those that lived 47 pounds.

The chief object of this season's work was increasing the number of colonies. For this purpose ten of the colonies were used. Two colonies were sent to Lacombe early in the spring and two were reserved for honey production. One colony gave neither increase nor surplus honey.

The increase amounted to an average of two from each of the colonies worked for that purpose. The two colonies gathering honey also gave one swarm each, bringing the total to thirty-five. Three colonies were shipped during the summer. One swarm was lost. A colony that had been used for exhibition purposes was united with another for the winter, so that thirty colonies remained for wintering.

The two hives utilized for honey production did as follows: one gave 48 pounds surplus of extracted honey valued at 16 cents per pound, or $7.68; the other gave 26 pounds of comb honey at 20 cents, and 14 pounds of extracted honey at 16 cents, total $7.44.

The profit and loss account of the apiary was, therefore, as follows, the value of the hives not being included:—

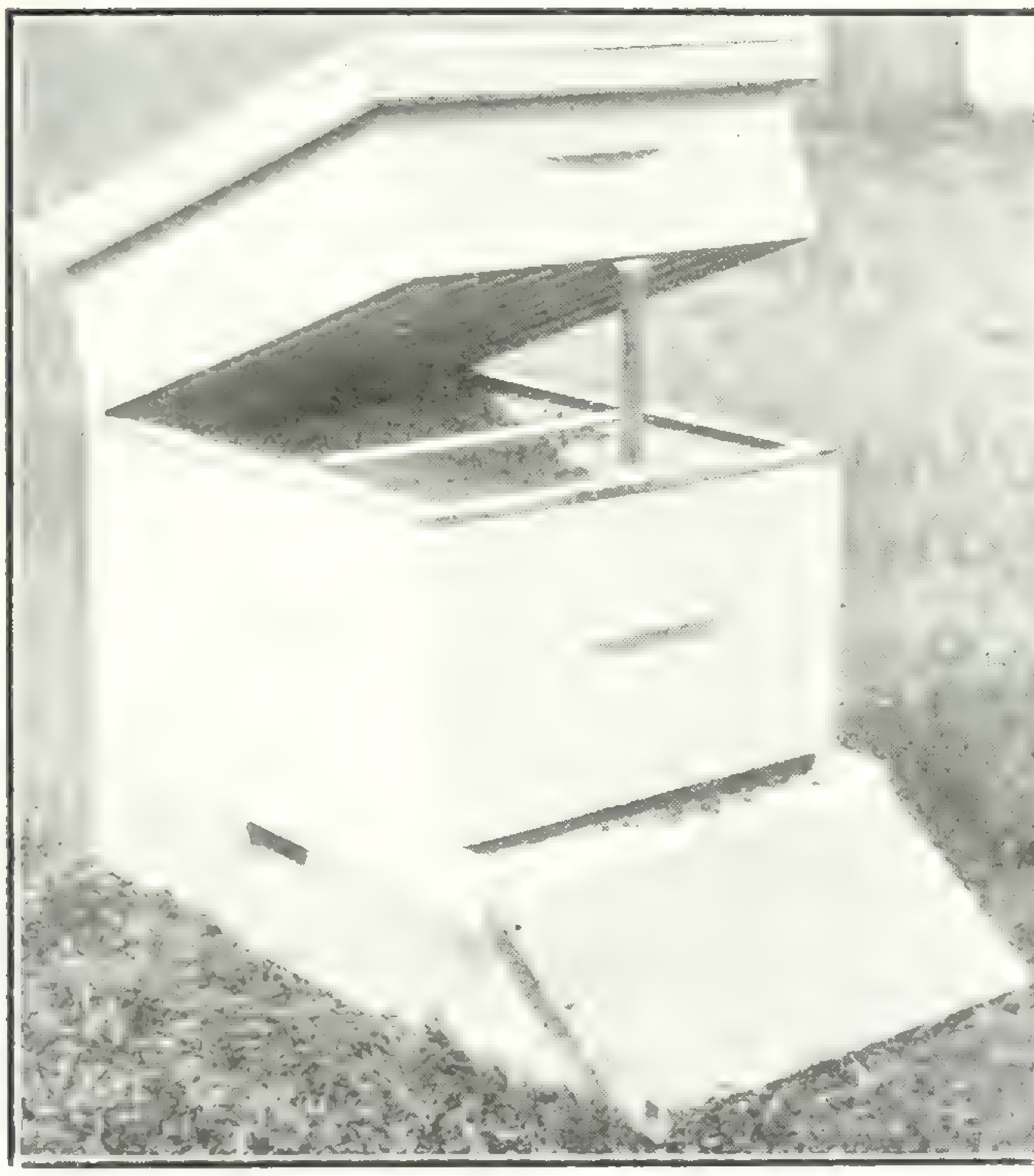
April 13—15 colonies at $5.00 each		$ 75.00
Nov. 1—30 " " 5.00 "	$150.00	
5 " sold " 5.00 "	25.00	
Honey sold	15.12	
Allowing a 25% loss as last winter		37.50
5% depreciation on 30 hives at $2.00 each		3.75
Cost of sugar for feeding		3.00
Profit		70.87
	$190.12	$190.12

The average weight of the hives on September 17 was 51·7 pounds and on November 12, 44 pounds.

Twenty-six colonies were placed in the cellar on November 12. When removed on April 8, 1915, all were found to be alive, although many dead bees were on the floor of the cellar.

Four colonies were wintered outside in a location sheltered from wind by trees in a specially constructed case to hold the four hives, with interspaces filled with cut straw. The average weight of these four hives on November 12 was 43 pounds, rather too light for safe wintering. Two of these colonies, including the lightest, weighing 36 pounds, died in the winter. The third was quite strong in the spring and the fourth weak.

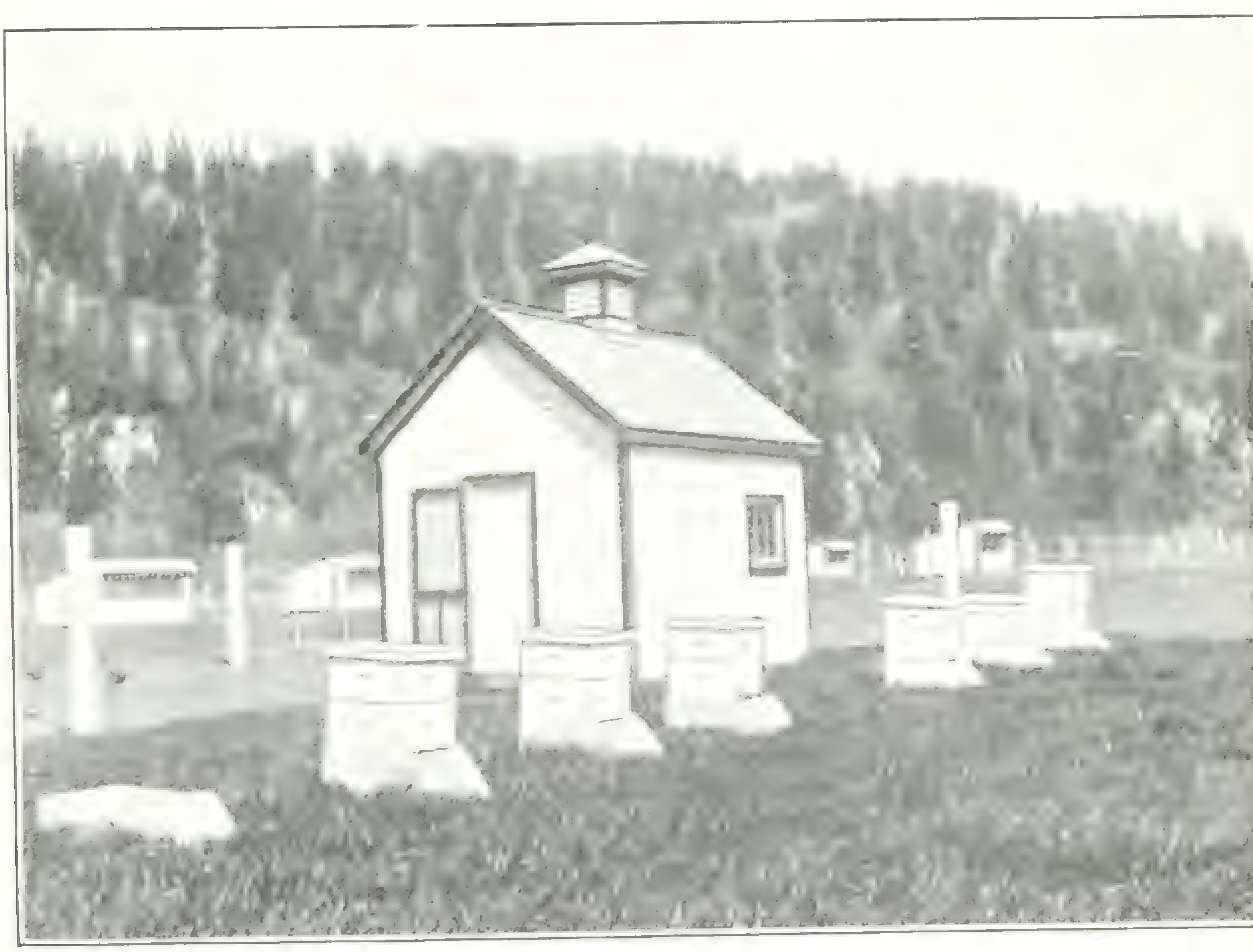
Sixty-five pounds of syrup was fed at the end of September to those colonies requiring it. The syrup was composed of 40 pounds of sugar and 25 pounds of water, and cost 4·6 cents per pound.



10-frame Langstroth Hive as used at Central Experimental Farm.

Wintering Bees out of doors at the Central Experimental Farm. Each case contains four hives, packed in shavings.

Ste. Anne de la Pocatière. Apiary.



Agassiz. Apiary.

Part of Apiary at Brandon Experimental Farm.

16—1916—63b.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, T. J. HARRISON, B.S.A.

During the summer of 1914 a start was made to build up an apiary at the Indian Head Experimental Station. Two colonies of bees were received on June 30 from Brandon. These were examined on July 2 and worker brood in all stages was found. In some of the frames the honey was capped. The colonies were both in good condition. On July 13 the hives were again examined and queen-cells were found. The queen-cells were destroyed and supers added. The brood chambers at this time were well filled with brood and honey. On September 15 the supers were taken off, there being no honey in any of them. Miller feeders were substituted, colony No. 1 getting fifteen pounds of syrup and colony No. 2 getting twenty pounds of syrup. On October 12 the feeders were taken off and the hives weighed. No. 1 weighed 60 pounds and No. 2, 68 pounds. On this date outer covers for the hives were made and put on.

The bees were put into the cellar on November 12. The bee-cellar was made by boarding up a small corner about six feet by ten feet in the cellar of the Superintendent's residence; a bench was built in on one side and a portion of it large enough to take the two hives was then screened in with wire mosquito netting to keep out the mice. A record was kept of the temperature in the cellar throughout the winter, the maximum temperature being 52° F. and the minimum temperature 38° F.

The colonies were taken out of the cellar and placed on their summer stands on March 22, an outer cover being placed over each for spring protection. No. 1 colony weighed 40 pounds and No. 2, 45 pounds. The bees came through the winter in good condition.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

Apiculture has never received much attention by residents in Southern Alberta, but it would appear that it would be worthy of more consideration, especially in the irrigated districts where alfalfa is being grown at all extensively.

Up to the present time but little apicultural work has been done at this Station. Two colonies of bees were on hand in the spring of 1914. They had been wintered in a root cellar, the conditions in which were not very satisfactory. The ventilation was poor, the air damp, and in the spring contaminated with the odour of decaying vegetables. On April 1 the hives were weighed and taken to a sheltered part of the garden. This shelter consisted of a row of cottonwood trees about fourteen feet in height. No. 1 hive weighed 40 pounds. No. 2 hive weighed 35 pounds. The weather at this time was somewhat windy, but was otherwise favourable, it being clear and with plenty of sunshine. Hive No. 1 appeared to be strong, and the bees started to work well, while hive No. 2 seemed weak and listless. A thorough examination was made in June, and No. 2 hive was found to be queenless, which was undoubtedly the reason for its inactivity. Two frames of brood containing young larvae were taken from No. 1 hive and placed in No. 2. From this brood a queen was reared and duly became fertilised.

Alfalfa, the chief source of honey, commenced to bloom the middle of June and continued until September. Wild flowers are not numerous.

During the season honey was extracted from No. 1 hive as follows:—

	Pounds.
July 25	46
August 28	44
September 23	10
Total for season	100

It was considered inadvisable to extract any honey from No. 2 hive.

Unfortunately, on August 25 a swarm of bees from No. 1 hive was lost. The final inspection made on September 24 showed that both colonies had queens and that their general condition was satisfactory.

On November 17, 1914, the hives were weighed and put in the cellar. No. 1 hive weighed 72 pounds and No. 2 weighed 65 pounds. The cellar in which the hives were put for winter was a 12ft. x 12ft. dugout, clean, and ventilated by two four-inch tile pipes in the roof so that the temperature remained fairly even at approximately 40·0° F. They appeared to winter well in these quarters. On March 31, 1915, the weight of the hives were: hive No. 1, 57 pounds; hive No. 2, 50 pounds. The general condition of both colonies was much more satisfactory than was the case the previous spring. Both had queens.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

The bees at this Station died in the winter of 1913-14, owing probably to the dampness in the root cellar in which they were wintered. Two new colonies were received from the Experimental Farm, Brandon, in the spring of 1914. A swarm was thrown off by one of the colonies during the summer, but was too weak and insufficiently provided with stores to survive the winter.

In 1914-15 the bees were wintered in a portion of the cellar of the office, which had direct communication with the outside air through a window covered with two thicknesses of burlap, the furnace being near enough to prevent the entrance of frost. The colonies consumed an average of 11½ pounds of honey during the winter, and both the original colonies came through strong. They were moved outside on April 8. The wild crocus came into bloom on April 12, four days after the bees were moved out.

EXPERIMENTAL STATION, INVERMERE, B.C.

REPORT OF THE SUPERINTENDENT, G. E. PARHAM.

Of the four colonies of bees wintered in the cellar in 1913-14, two survived and were placed in the open early in April. Of the two wintered outside, one survived. Early in July two of the hives were making progress, but the remaining one was found to be queenless, and was re-queened with a queen obtained from a neighbour's apiary.

No swarms were obtained and, either through mismanagement or unfavourable season, only ten pounds of honey were extracted. In September twenty pounds of sugar-syrup were supplied to the bees to make up the required weight of winter stores, and all the colonies went in winter quarters with adequate supplies. One hive was wintered in the cellar, and two outside, in a case packed with shavings.

The colonies were examined in March when the queens in each colony were seen. One of those wintered outside was found to be in a strong condition, the other weak. The one taken from the cellar was also in a weak condition.

In March a new man was engaged to take charge of the poultry and bees, and brought with him a supply of bees which he had successfully reared in the vicinity of Cranbrook, B.C.

These bees are in a strong condition, and the weather conditions being favourable, they immediately began collecting nectar and pollen from the willows. The apiary has now been moved to a more sheltered part of the Station, and it is hoped that the new conditions will be more favourable for bee work..

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

This section of the work on the Farm has been for the past year in the charge of Mr. V. Kuhn, who looked after the apiary in the time which he could spare from his regular work with the poultry, and as a result the bees have improved in general condition and have given decidedly better returns.

In the autumn of 1913 the ten hives of bees were set close together on a plank stand, about three inches above the ground. They were covered on three sides with roofing-felt to protect them against dampness; and the front facing south was left open. They were wintered in the open, on the south side of an evergreen windbreak.

In the spring of 1914, the bees in seven out of the ten hives were alive, although short of stores; three having apparently starved to death. In the early spring they were fed with thin sugar syrup. During the summer one colony cast a swarm, which was hived, and another evidently became queenless for the bees combined with a stronger colony, leaving plenty of stores behind them.

The seven colonies produced 375 pounds of extracted honey, making an average of slightly over 53·5 pounds per hive. The best colony gave 90 pounds, while the least productive managed to gather about 35 pounds of stores, just enough to carry them over the winter. The chief sources of the honey for the year were: white and alsike clover, fireweed, maple and goldenrod. The honey was of good quality and a medium amber colour. It was prepared for sale in 5-pound tin containers.

A hive was kept on scales during the month of July and the daily increase in weight checked, in an attempt to measure the daily flow of honey. The greatest increase in weight for one day was 8 pounds, recorded on July 12.

Seven colonies with a good supply of food were prepared for the winter of 1914-15. Each hive was encased in a close fitting wooden cover with a pad of sacks, three inches thick, on the top of the frames, the whole being covered with a galvanized iron lid. Until January 26 they were kept on the south side of an evergreen hedge, but on that date they were removed into the new bee-yard in an open field, and placed on individual stands, as may be seen in the accompanying illustration.

The covers were left on till March 8, 1915. When these were removed the colonies were found to be in excellent condition; there was an average of two and one-half frames of stores to each hive, bees in every space, and brood in all stages, with the exception of one colony which was apparently queenless. This particular colony was re-queened with an Italian queen in September, but the queen died before being liberated; another was put in later and accepted, but she was apparently killed during the winter. In the spring the bees from this colony united with another colony, leaving two full frames of honey behind them. Four other Italian queens were introduced during September. At the time of writing the six hives have all had supers added to them and are full of bees. The illustration shows the condition of the six hives on March 31, 1915.

During the summer a small bee-house was erected for the storing of supplies and extracting of honey.

EXPERIMENTAL STATION, SIDNEY, B.C.

REPORT OF THE SUPERINTENDENT, LIONEL STEVENSON, B.S.A., M.S.

During the first week in March, 1914, ten colonies of hybrid Italian bees in 8-frame hives were bought from a local farmer. They were found to be in good condition when examined two weeks later. Five of the colonies were supered with sections for comb honey production, and five with extracting supers. In June and July seven swarms came off the colonies supered with sections, and only nine sections were completed.

The colonies devoted to extracted honey production gave only one swarm and yielded 285 pounds of honey, the largest amount produced by a single colony being 92 pounds 4 ounces. The honey was of very fine quality and sold readily in small quantities in glass jars at 25 cents per pound.

The apiary is situated within half a mile of the sea and partly surrounded by large tracts of forest, giving the bees but a small area for foraging over.

The principal sources of honey are white Dutch clover and fireweed. In the autumn the number of colonies was reduced to twelve by uniting the weak ones, and they were fed with syrup to bring the weight of each hive up to about sixty pounds.

The only winter protection given was a chaff cushion about two inches thick placed over the quilt in a six inch bottomless box which telescoped over the upper part of the brood chamber to the depth of about an inch and was covered with a waterproof and ventilated roof. All the colonies were wintered in the open with their entrances contracted to five inches. They all survived the winter, but they were not very strong and built up rather slowly in the spring, the situation of the apiary being somewhat exposed.

The willows around the hives were in full bloom on March 12, 1915, and by the 27th the fields and roadsides were a golden glow of dandelions from which the bees gathered pollen and nectar.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF FORAGE PLANTS

For the Year ending March 31, 1915

PREPARED BY

The Dominion Agrostologist, Central Farm, Ottawa.	M. O. Malte, Ph.D.
Superintendent—	
Experimental Station, Charlottetown, P.E.I.	J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S.	W. W. Baird, B.S.A.
Experimental Station, Kentville, N.S.	W. Saxby Blair.
Experimental Station, Fredericton, N.B.	W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, Que.	Joseph Bégin.
Experimental Station, Cap Rouge, Que.	G. A. Langelier.
Experimental Farm, Brandon, Man.	W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask.	T. J. Harrison, B.S.A.
Experimental Station, Rosthern, Sask.	Wm. A. Munro, B.A., B.S.A.
Experimental Station, Scott, Sask.	M. J. Tinline, B.S.A. (Acting).
Experimental Station, Lethbridge, Alta.	W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta.	G. H. Hutton, B.S.A.
Experimental Farm, Agassiz, Alta.	P. H. Moore, B.S.A.
Experimentalist, Substation at Fort Vermilion, Alta.	Robert Jones.

REPORT FROM THE DIVISION OF FORAGE PLANTS

OTTAWA, March 31, 1915.

J. H. GRISDALE, B. Agr.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the third annual report of the Division of Forage Plants for the year ending March 31, 1915.

Included will be found reports from the Experimental Farms and Stations on which work with forage plants is undertaken, and also a brief report from the substation at Fort Vermilion, Alta.

During the year, the breeding work with grasses and leguminous forage plants, started in 1912 and 1913 respectively, has been progressing very satisfactorily. Although, on account of the very nature of the breeding work referred to, final results have not yet been obtained, it may be stated that the breeding work so far conducted promises to lead to results which will prove of great importance to agriculture in Canada.

In addition to the ordinary work with field roots, consisting chiefly of variety tests, preliminary work has been started with the object of improving, by breeding, the most prominent varieties now obtainable commercially.

Steps have also been taken to secure data bearing on the possibility of raising seed of field roots profitably in Canada, especially in the eastern provinces.

Owing to the fact that I had to spend almost the whole summer in Western Canada, preparing a collection of grasses for the Canadian Exhibit at the Panama-Pacific Exposition, San Francisco, Cal., practically all the work with forage plants carried out at the Central Experimental Farm during the summer was directed and led by my Assistant, Mr. F. S. Browne, B.S.A. I am greatly indebted to Mr. Browne for his most able and competent work.

I have the honour to be, sir,
Your obedient servant,

M. O. MALTE,
Dominion Agrostologist.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION AGROSTOLOGIST—M. O. MALTE, Ph.D.

INDIAN CORN.

Variety tests with Indian corn were again conducted with the object of ascertaining the comparative value of different varieties for the Ottawa district.

The land used for the experiment was in hoed crop in 1913, and had, that year, been well manured and limed. It was ploughed in the spring of 1914 and afterwards disced and drag harrowed. No manure was applied.

Twelve varieties were tested, each variety being grown in duplicate plots, one-one hundredth of an acre in size. The seed was sown on May 29, in hills three feet apart each way. All varieties were harvested on September 13.

Of the twelve varieties tested, four produced a comparatively large number of well ripened ears. These varieties are all low yielding as far as the tonnage of ensilage is concerned, and can therefore not be recommended as ensilage varieties for districts in which, normally, higher yielding varieties reach the proper ensilage stage. In such districts they may, however, be profitably grown for grain.

On account of their rapid growth they are able to reach a stage of maturity sufficiently advanced for making good ensilage comparatively far north, and may therefore be grown to advantage in districts where other varieties fail to produce ensilage of desirable quality.

The varieties referred to are Quebec Yellow, Windus Yellow Dent, Canada Yellow and Free Press. Their yield of ripe ears is indicated by the following table. In computing the yields, 72 pounds of husked crib-dried cobs was taken as the weight per bushel.

INDIAN CORN, Harvested for Grain.

No.	Variety.	Condition when cut.	Yield per acre 1st plot.		Yield per acre 2nd plot.		Average Yield per acre.	
			Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1	Quebec Yellow	Late dough to ripe	88	40	111	30	99	71
2	Windus Yellow Dent	" "	57	10	103	40	80	25
3	Canada Yellow	" "	77	10	78	40	77	61
4	Free Press	Ripe	42	60	51	30	47	9
	Average		66	30	86	47	76	24

Of the eight remaining varieties, *i.e.*, the ensilage varieties proper, the Argentine Yellow, as will be seen from the following table, was the heaviest producer. This is a southern variety which has not been tested at Ottawa before. Although a heavy yielder, it may, in reality, be inferior to other varieties as an ensilage corn. It only reached the milk stage and consequently gave an ensilage containing less milk and flesh forming units to the acre than other more advanced but less yielding varieties.

In the following table are given the yields of the varieties harvested for ensilage:

INDIAN CORN for Ensilage—Test of Varieties.

No.	Variety.	Condition when cut.	Height.		Yield per acre. 1st plot		Yield per acre. 2nd plot		Average Yield per acre.	
			Ft.	In.	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.
1	Argentine Yellow....	Late milk	10	0	19	00	21	200	20	100
2	White Cap Yellow Dent..............	Early dough........	9	0	19	1,000	20	1,000	20	00
3	Golden Glow........	Late milk to dough .	9	6	19	00	20	700	19	1,350
4	King Philip...........	" " .	9	8	19	1,400	17	700	18	1,050
5	Wisconsin No. 7......	Med. dough........	9	6	16	1,000	20	200	18	600
6	Bailey................	Early dough........	9	6	16	-00	19	1,700	17	1,850
7	Longfellow...	"	8	6	15	200	16	300	15	1,250
8	Salzer's North Dakota.	"	8	4	12	1,400	16	800	14	1,100
	Average..........	....	...	.....	17	375	18	1,950	18	163

FIELD ROOTS.

VARIETY TESTS.

During the year, the usual comparative tests with different varieties of field roots were conducted. Several varieties which previous experiments have found below the average standard were eliminated this year. On the other hand a number of new varieties, chiefly of European origin, were subjected to comparative tests. Not less than 66 varieties were grown, including 30 varieties of turnips, 24 varieties of mangels, 8 varieties of carrots and 4 varieties of sugar beets.

The land allotted to the experiments was a medium loam, upon which roots and corn had been grown the previous season. It was therefore in a good state of tilth and as it had been well manured and limed for the preceding crop, no fertilizer was used. After ploughing during the late fall of 1913, the soil was worked up well with a heavy disc-harrow followed by a drag in the spring of 1914. Before planting, the land was ridged up into low drills which were worked down with a hand rake. Later they were further flattened by the roller on the seeder.

Mangels, carrots and sugar beets were sown on May 12 and thinned June 4 to 6, while turnips were sown June 1 and thinned June 20 to 22. During the season the land was hand-hoed once, wheel-hoed three times and cultivated with a horse cultivator four times. Mangels were harvested October 14 to 16, sugar beets October 15, carrots November 3 and turnips November 3 to 6.

TURNIPS.

Eighteen varieties of turnips were tested in duplicate plots.

At the time of planting, the weather was hot and dry, but in spite of this, the seed germinated well. All varieties made a good start and the growth was quite satisfactory up to the end of August. Unfortunately, the prospects of a heavy crop, so promising in the early part of the summer, were considerably reduced during the latter part of the season, inasmuch as the growth of the crop was somewhat checked through a severe attack of a fungous disease.

The disease referred to—caused by a *Phoma* species—attacks the crown of the roots and also the roots themselves. The first perceptible sign of it is the withering of the leaves, the result consequently being that the growth of the roots is either stopped

or more or less checked. Decay of the crown of the roots is also caused, opening the way for numerous other putrefactive organisms. In severe cases, the *Phoma* attack results in the loss of the entire root.

The varieties which suffered the severest shock from the disease were Corning's Lapland, Kangaroo, Skirving's and Jumbo. Very little injury was recorded in Canadian Gem, Hartley's Bronze Top, Hall's Westbury, Magnum Bonum, Empress and Durham.

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre.										Per cent Dry Matter.	Dry Matter per Acre.	
		1st Plot.				2nd Plot.				Average.				
		Ton.	Lb.	Bu.	Lb.	Ton.	Lb.	Bu.	Lb.	Ton.	Lb.	Bu.	Lb.		Ton.	Lb.
1	Canadian Gem........	26	1,300	888	20	26	400	873	20	26	850	880	50	10 80	2	1,707·8
2	Hartley's Bronze Top..	31	00	1,033	20	23	1,600	793	20	27	800	913	20	10·14	2	1,556·7
3	Hall's Westbury......	27	1,800	930	00	22	00	733	20	24	1,900	831	40	11 00	2	1,489·0
4	Empress........	28	400	940	00	26	1,300	888	20	27	850	914	10	9·90	2	1,430·1
5	Durham............	27	00	900	00	27	1,300	921	40	27	650	910	50	9·90	2	1,410·3
6	Corning's Lapland.. ..	26	1,500	891	40	23	1,600	793	20	25	550	842	30	10·70	2	1,408·8
7	Magnum Bonum.....	26	200	870	00	23	00	766	40	24	1,100	818	20	10·80	2	1,302·8
8	Good Luck..........	25	500	841	40	25	800	846	40	25	650	844	10	10·10	2	1,115 6
9	Halewood's Bronze Top	26	100	868	20	23	300	771	40	24	1,200	820	00	10·20	2	1,018·4
10	New Century.........	21	700	711	40	24	1,200	820	00	22	1,950	765	50	11·00	2	834·5
11	Jumbo..............	25	1,700	861	40	22	600	743	20	24	150	802	30	9·90	2	766 8
12	Bangholm............	24	00	800	00	20	1,100	685	00	22	550	742	30	10·66	2	749·0
13	Kangaroo.......... ...	26	1,300	888	20	18	1,300	621	40	22	1,300	755	00	10 36	2	693·0
14	Best of all.	25	1,600	860	00	26	300	871	40	25	1,950	865	50	9·00	2	675·5
15	Perfection......	28	00	933	20	22	1,000	750	00	25	500	841	40	9·20	2	646·0
16	Hazard's Improved....	18	1,600	626	40	22	1,500	758	20	20	1,550	692	30	10·80	2	487·4
17	Skirving's.	26	400	873	20	21	1,200	720	00	23	1,800	796	40	9·38	2	483·6
18	Mammoth Clyde.....	22	1,000	750	00	20	1,600	693	20	21	1,300	721	40	9·94	2	304·0
	Average..........	25	1,561	859	21	23	839	780	39	24	1,200	820	00	......	2	1,004·4

In addition to the varieties, tabulated above, a number of varieties, obtained from Sweden and Denmark, were also tested. Only small samples of seed were available and, as a consequence, each variety was grown in a single plot.

The results, as given below, indicate that the varieties in question proved inferior to the American varieties. Although, of course, their seeming inferiority can not be considered positively proven from one year's tests, it seems that they are not as well adapted to the hot summer climate of the Ottawa district as are the American varieties. The hot weather caused the leaves to wither down prematurely, the result being that the top did not reach its full growth. The small top of the Swedish and Danish varieties was a very conspicuous character, strongly contrasting with the strong top of the American ones.

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre.				Per cent. Dry Matter.	Dry Matter per Acre.	
		Ton.	Lb.	Bush.	Lb		Ton.	Lb.
	Swedish Varieties—							
1	Weibull's Ostersundom (swede)	20	1,400	690	00	10·2	2	222·8
2	" Pedigree Bortfelder (fall)	21	1,600	726	40	7·8	1	1,400 8
3	" Svensk Slat (fall)	18	500	608	20	8·4	1	1,066·0
4	" Bangholm (swede)	15	600	510	00	9·6	1	937·6
5	" Sekel (fall)	16	800	546	40	7·4	1	427·2
	Average	18	980	616	20		1	1,210·9
	Danish Varieties—							
1	Paibjerg Bangholm (swede)	20	800	680	00	10·00	2	80 0
2	Shepherd's Golden Globe (swede)	19	400	640	00	10·00	1	1,840·0
3	Danish Yellow Tankard (fall)	20	00	666	40	8·30	1	1,320·0
4	Oslgaard Bangholm Short Neck (swede)	16	00	533	20	10·18	1	1,257·6
5	Dale's Hybrid (fall)	19	900	648	20	8·20	1	1,189·8
6	Fynsk Bortfelder (fall)	19	900	648	20	8·20	1	1,189·8
7	Greystone (fall)	12	400	406	40	8·50	1	74·0
	Average	18	200	603	20		1	1,278·7

MANGELS.

The early seeding and the good germination ensured a good stand in the early part of the summer. Up to the middle of July the growth was very satisfactory. The prolonged hot and dry weather in the middle of the summer, however, caused considerable tip burn, and as a result the growth was somewhat checked.

The tip burn influenced the growth of different varieties in a markedly different way. Varieties with a small top, such as Globes and Tankards, practically ceased growth when badly attacked. Heavier topped varieties, such as Giant Half Sugar White and many of the Long Red and Yellow Intermediate varieties, were less seriously attacked and also, when affected, seemed to recuperate more easily after the cessation of the dry period.

The following table gives the yields of thirteen varieties grown in duplicate plots:—

MANGELS.—Test of Varieties.

No.	Variety.	Yield per Acre.												Per cent Dry Matter.	Dry Matter per Acre.	
		1st Plot.				2nd Plot.				Average.						
		Ton.	Lb.	Bu.	Lb.	Ton.	Lb.	Bu.	Lb.	Ton	Lb	Bu.	Lb.		Ton.	Lb.
1	Giant Half Sugar White	21	200	703	20	23	1,500	791	40	22	850	747	30	17·20	3	1,714·2
2	Danish Sludstrup	18	300	605	00	30	600	1,010	00	24	450	807	30	14·42	3	986·5
3	Giant Yellow Intermediate	22	1,400	756	40	29	1,300	988	20	26	350	872	30	13·04	3	826·4
4	Gate Post	23	1,200	786	40	22	600	743	20	22	1,900	765	00	14·40	3	609·6
5	Improved Mammoth Saw-log	22	1,400	756	40	24	700	811	40	23	1,050	784	10	14·04	3	695 8
6	Mammoth Yellow Intermediate	21	100	701	40	31	900	1,048	20	26	500	875	00	12·44	3	531 0
7	Prize Mammoth Long Red.	18	800	613	20	25	1,800	863	20	22	300	738	20	13·60	3	24 8
8	Mammoth Long Red	17	500	575	00	23	00	766	40	20	250	670	50	14·68	2	1,908·7
9	Yellow Leviathan	23	1,500	791	40	26	600	876	40	25	50	834	10	11.52	2	1,7[illegible]5·7
10	Perfection Mammoth Long Red	18	1,800	630	00	23	1,700	795	00	21	750	712	30	12·52	2	1,352·3
11	Golden Tankard	21	100	701	40	21	1,000	716	40	21	550	709	10	12·54	2	1,335 7
12	Selected Yellow Globe	20	900	681	40	24	700	811	40	22	800	746	40	11·68	2	1,232·6
13	Giant Yellow Globe	20	700	678	20	24	100	801	40	22	400	740	00	11·16	2	955·0
	Average	20	1,454	690	54	25	885	848	5	23	169	769	29		3	142·3

A number of varieties from Sweden and Denmark were tested in single plots, the small quantity of seed available making it impossible to sow two plots of each variety.

The results, as given below, indicate a slight general inferiority of the varieties as compared with the American varieties recorded above.

One of the Danish varieties, viz.: Elvetham Mammoth, proved far superior to all the other ones. The Elvetham Mammoth has a much larger top than any other of the varieties tested and this may account for its heavier yield. That this explanation is reasonable seems to be borne out by the general experience, gained this summer, that such varieties of both mangels and turnips which were characterized by heavy top, were much less influenced by the hot and dry summer than those possessing a small top.

MANGELS.—Test of Varieties.

No.	Variety.	Yield per acre.				Per cent Dry Matter.	Dry Matter per acre.	
		Ton.	Lb.	Bush.	Lb.		Ton.	Lb.
	Danish varieties—							
1	Elvetham Mammoth	28	1,800	963	20	12·30	3	1,090·4
2	Taaroje Barres	22	00	733	20	13·70	3	28·0
3	Danish Eckendorffer Rod	25	200	836	40	11·00	2	1,522·0
4	Danish Eckendorffer Gul	24	800	813	20	11·00	2	1,368·0
5	Sludstrup Barres	16	1,600	560	00	12·06	2	52·1
	Average	23	880	781	20		2	1,595·9
	Swedish varieties—							
1	Weibull's Barres Rodgul	23	200	770	00	13·48	3	227·7
2	Weibull's Ljusrod	21	800	713	20	14·04	3	9·1
3	Weibull's Eckendorffer Rod	23	1,000	783	20	12·06	2	1,668·2
4	Weibull's Cylinder Barres	22	800	746	40	12·44	2	1,573·1
5	Weibull's Eckendorffer Gul	20	1,800	696	40	10·98	2	589·6
6	Weibull's Excelsior Rod	23	00	766	40	9·62	2	425·2
	Average	22	767	746	7		2	1,415·5

CARROTS.

Five varieties of carrots were sown in duplicate plots. The seed germinated very slowly and most of the varieties had to be partly resown. In spite of this, a fair stand was obtained, and the results, as tabulated below, give a fairly comprehensive idea of the yielding power of the varieties.

CARROTS.—Test of Varieties.

No.	Variety.	Yield per Acre.												Per cent Dry Matter.	Dry matter per acre.	
		1st Plot.				2nd Plot.				Average.						
		Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.		Ton.	Lb.
1	White Belgium	23	1,000	783	20	24	1,800	830	00	24	400	806	40	12·20	2	1,904·8
2	Ontario Champion	23	400	773	20	26	1,600	893	20	25	00	833	20	11·30	2	1,650·0
3	Mammoth White Intermediate	22	1,100	751	40	25	1,200	853	20	24	150	802	30	10·90	2	1,248·3
4	Improved Short White	20	1,100	685	00	25	1,300	855	00	23	200	770	00	10·80	2	989·6
5	Giant White Vosges	17	1,700	595	00	24	900	815	00	21	300	705	00	10·90	2	610·7
	Average	21	1,060	717	40	25	960	849	20	23	1,010	783	30		2	1,280·7

Three Danish varieties, of which only a small quantity of seed was available, were tested in single plots. The results are recorded below.

CARROTS.—Test of Varieties.

No.	Danish Varieties.	Yield per Acre.				Per cent Dry Matter.	Dry Matter per Acre.	
		Ton.	Lb.	Bush.	Lb.		Ton.	Lb.
1	Champion	29	1,500	991	40	12·8	3	1,616·0
2	James	16	200	536	40	11·60	1	1,735·2
3	Nantes	10	00	333	20	10·90	1	180·0
	Average	18	1,233	620	33	....	2	510·4

SUGAR BEETS.

Four varieties of sugar beets were tested in duplicate plots. The germination of the seed was satisfactory and all varieties made an even growth throughout the season. Although no variety seemed to be perceptibly affected by the hot dry weather and no tip burn was observed, the yield, which was lower than that of previous years, indicates that the sugar beets suffered somewhat from the unfavourable summer weather.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per Acre.											
		1st Plot.				2nd Plot.				Average.			
		Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.
1	Vilmorin's Improved A	14	500	475	00	14	300	471	40	14	400	473	20
2	French Very Rich	14	600	476	40	13	1,800	463	20	14	200	470	00
3	Klein Wanzleben	14	00	466	40	13	300	438	20	13	1,150	452	30
4	Vilmorin's Improved B.	14	300	471	40	12	1,300	421	40	13	800	446	40
	Average	14	350	472	30	13	925	448	45	13	1,637	460	37

COMPARATIVE VALUE OF VARIETIES OF FIELD ROOTS.

During the last two years, all variety tests, whenever practical, have been conducted in duplicates. That is to say, each variety has been tested in two plots and its yielding capacity judged from the average yield of the two plots. By the duplicate plot system the disturbing influence of soil variation on the yielding capacity of the different varieties as expressed by the tonnage produced is, to a great extent, eliminated. The average yield of two plots of a variety therefore constitutes a truer expression of its real yielding power than does the yield secured from a single plot only. This is especially true on land which has been used for experiments of a varied nature during preceding years and which, for this reason, may be more or less uneven as to productive power and mechanical condition.

The value of the duplicate plot system in comparative tests has been amply proven during the two years it has been followed and this not only at the Central Experimental Farm but also at all the Branch Farms and Stations where it has been introduced.

OTTAWA.

The actual value of a variety of field roots as food for animals does, however, not only depend upon its yielding capacity as expressed in tons or bushels, but also on its feeding value as expressed by its chemical composition, *i.e.* the dry matter content produced to the acre. As the percentage of dry matter, normally found in different varieties, is varying with the variety, it follows that a certain tonnage produced by a certain variety is not necessarily equivalent in feeding value to the same tonnage produced by another variety. A few examples will make this clear.

The Giant Half Sugar White Mangel (see table on page 1021) yielded 22 tons 850 pounds to the acre, with a dry matter percentage of 17·20. The dry matter produced to the acre was 3 tons 1,714·2 pounds. The Selected Yellow Globe gave a yield of 22 tons 800 pounds or approximately the same as the Giant Half Sugar White, but as its dry matter percentage was only 11·68, the actual food harvested from an acre amounted only to 2 tons 1,232·6 pounds or about 70 per cent of that secured from the Giant Half Sugar White variety.

Corning's Lapland and Perfection, both swede turnips (see table page 1020) yielded approximately the same, viz.: 25 tons 550 pounds and 25 tons 500 pounds respectively to the acre.

The percentage of dry matter of the former being 10·70, it produced 2 tons 1,408 pounds of dry matter to the acre, whereas the latter variety, with 9·20 per cent dry matter, produced only 2 tons 646 pounds solid food, or about 15 per cent less of actual food constituents than was produced by Corning's Lapland.

As the dry matter produced to the acre is determined by the tonnage and the percentage of dry matter characteristic of the variety, it naturally follows that a variety containing a high percentage of dry matter may actually produce more dry matter to the acre and thus furnish more food than a variety characterized by low dry matter content, in spite of the fact that the yield of the latter as expressed in tons or bushels may be considerably higher than that of the former.

For instance, the Giant Half Sugar White Mangel yielded three and three quarters ton less than the Giant Yellow Intermediate (see table page 1021) but owing to its higher percentage of dry matter, it produced about 900 pounds more dry matter to the acre than the latter variety.

The New Century Turnip yielded three tons less than the variety called Best of All, but in spite of this it produced more dry matter to the acre than the latter.

The above examples tend to show the advisability of growing field root varieties which not only are capable of producing a large tonnage to the acre but also are characterized by a high dry matter content.

COMPARATIVE value of Mangels, Turnips and Carrots, Average of all varieties grown, 1914.

No.	Crop.	Yield per Acre.				Dry Matter.	
		Ton.	Lb.	Bush.	Lb.	Ton.	Lb.
1	Mangels	23	50	767	30	2	1,847·8
2	Carrots	21	1,359	722	39	2	975·4
3	Turnips	22	130	735	30	2	336·4

OTTAWA.

GROWING FIELD ROOTS FOR SEED.

At present, practically all seed of Field Roots used in Canada is being secured from foreign countries. Only a very small amount of seed of certain varieties of mangels, turnips, carrots and sugar beets is being raised in Canada. This seed, however, can fully compete, as far as quality is concerned, with the best imported seed. As a matter of fact, the experience of the farmers engaged in seed raising tends to show that seed of a variety grown in a certain district gives a better crop of roots when sown in that district than seed of the same variety imported from somewhere else.

So far, actual data bearing on the possibilities of growing field root seed profitably in different parts of the Dominion have not been secured by the Experimental Farms. With a view of securing such data, seed roots have been selected for planting in 1915 on several of the Experimental Farms and Stations.

At Ottawa, about 12,000 roots, weighing 15 tons, were selected from the farm crop of Mammoth Long Red Mangel, to be used for seed production in 1915. Of this number, over 6,500 were stacked in the root cellar. The balance was pitted outside. The roots stored in the cellar all proved sound in the spring of 1915, whilst of the roots pitted outside a small percentage rotted.

In addition, about three tons of mangels of the Long Red and Yellow Intermediate varieties were saved from the crop grown for variety tests by the Division of Forage Plants.

BREEDING NEW VARIETIES OF FIELD ROOTS.

Observations have been made by the Division of Forage Plants to the effect that many of the varieties of field roots most widely used in Canada, are lacking in uniformity, not only as far as the characteristics of the roots are concerned, but also as to the character of the seed produced by different individuals belonging to the same variety. The variation of individual roots belonging to the same variety as to chemical composition has also proven to be considerable. In other words, many varieties are not as uniform as they should be, and could therefore be improved by breeding.

With a view to raising new varieties superior to the old ones as to uniformity and feeding value, a number of roots of Swede turnips and mangels were selected in 1913. Owing, however, to unsatisfactory storage causing soft rots, their number was greatly reduced during the winter of 1913-14. During the year seed was obtained from 14 swedes and 7 mangels. The plants producing this seed were isolated and self-fertilized and the seed obtained harvested separately from each individual plant.

For further breeding work, 200 mangels, 250 turnips, and 60 carrots were selected from the leading varieties during the year.

LEGUMINOUS FORAGE PLANTS AND GRASSES.

ALFALFA.

Hardiness.—The extraordinary value of alfalfa for the development of the dairy and live stock industry being universally recognized by all agricultural Canada, its growing and general use as forage is being most vigorously advocated. Many of the difficulties in growing alfalfa successfully, encountered in years past, have been gradually removed and, as a result, alfalfa has proven itself well adapted to large areas in Canada. Where the soil and moisture conditions are suitable and where the winter climate allows it to survive without injury, it yields heavier returns than any other leguminous forage crop.

In those parts of Canada where the winters are severe winter-killing may be apt to prevent its profitable growing. The extent of the winter-killing and, as a consequence, the prospects for successful alfalfa growing in a district with severe winters depend, however, very much on the variety of alfalfa used.

It has been clearly demonstrated by the numerous experiments carried out by the Experimental Farms, that partial or total failure may be encountered if a variety is used which has been originated in a southern country and which for this reason is lacking in hardiness. On the other hand, it has also been demonstrated that the danger of winter-killing is much less if a variety is used which has been originated in a country where the climatic conditions are similar to those prevailing in the district where the alfalfa is to be grown.

The explanation of these facts rests with the nature of what is termed hardiness or ability to withstand severe winter climate.

The results of observations and experiments clearly show that hardiness is a hereditary character, that is to say that a hardy plant produces a progeny which also is hardy. When an alfalfa variety, for instance Grimm's Alfalfa or Ontario Variegated, is called hardy, it means that the variety in question is composed of hardy individuals which, when propagated by seed, give rise to plants which also are hardy. Hardiness is, however, only a relative character. That is to say that a variety which is able to stand, say a temperature of 20 below zero, is not necessarily able to survive where the temperature drops to 50 below. It may be totally or only partially winter-killed. When total winter-killing occurs, it means that one hundred per cent of the individuals within the variety are too tender. When the winter-killing is only partial, it means that a certain number of the plants are hardy to the conditions under which they have been able to survive.

The hardiness thus being a character attached to the individual plants within a variety, there is evidently a possibility of increasing the hardiness of a variety, or, in other words, to increase the percentage of hardy individuals within a variety simply by propagation, by seed, of such individual plants as prove hardy.

In order thus to secure a perfectly hardy variety of alfalfa the Division of Forage Plants has saved seed from its alfalfa plots for some years. Part of the seed obtained has been distributed to farmers in districts where the winter conditions are far too severe for ordinary alfalfa. Reports secured from several of the farmers all agree that the alfalfa crop raised from this seed is quite satisfactory, and that the degree of hardiness is far above that of ordinary alfalfa.

That alfalfa originated from seed secured from plants able to survive severe winters, represents a variety which is hardier than ordinary alfalfa, was also demonstrated at the Central Experimental Farm, this year.

During the summer of 1913, one thousand plants raised from seed of plants which survived the previous very unfavourable winter, were transplanted in the experimental field for breeding purposes. On account of the very dry weather in August and September, the plants made a very unsatisfactory growth and entered the winter in a rather poor condition, but, in spite of this, they stood the winter of 1913-14 unexpectedly well. Only a very few plants were lost.

Briefly, the results obtained so far, clearly indicate that the safest if not the only way to secure a perfectly hardy alfalfa is to use seed produced as far north as possible. Whenever such seed is used there is little danger of crop failure on account of winter-killing.

Breeding for Uniformity and High Quality.—The first step in the breeding work with alfalfa is necessarily the production of a hardy variety. This accomplished, breeding for other qualities apt to raise the standard of the variety can be undertaken.

The hardiest varieties obtainable commercially at present are Grimm's and Ontario Variegated alfalfa. Both, however, are far from uniform and can therefore be

improved upon in that respect. They are also somewhat inferior to pure alfalfa in quality, because they have been developed from crosses between the latter and Yellow Lucerne, a species which is much inferior to the pure alfalfa as far as quality and palatibility are concerned.

A certain percentage of plants of Grimm's and Ontario Variegated, however, have inherited the quality characters of pure alfalfa, and are, for this reason, superior to the average plants of the varieties in question. From such plants superior strains can therefore be produced.

Even pure alfalfa is far from uniform, practically any field showing a great variation of the individual plants in characters affecting the quality, yielding capacity and general value of the crop. It will therefore be possible to breed, also from pure alfalfa, strains superior to the alfalfa varieties now available.

For breeding work of the character referred to, one thousand plants were secured in 1913. During 1914, seventeen lots of plants, with a total of 570 individuals, raised from seed obtained through self-fertilization of plants having outstanding characters, were transplanted in the experimental field. In addition, eight lots having from four to thirty plants each, were secured from seed, obtained by cross-fertilization of selected plants.

RED CLOVER.

Hardiness.—Hardiness being essential for successful red clover growing in many parts of Canada, the Division of Forage Plants started, in 1913, an experiment with the intention to demonstrate how red clover can be easily improved as to hardiness. The principle worked on for the production of hardy varieties from comparatively tender ones is essentially the same as that followed in the breeding work with alfalfa. The work is based on the well established fact that what is called a "variety" of red clover, is in reality a mixture of many different varieties or types, having not only different forage value, but also displaying different degrees of hardiness. Breeding for hardiness simply means elimination of all types which are too tender, and propagation of such types which are able to winter satisfactorily. As the elimination of the tender types is done by nature herself, the breeding work to be done by man simply consists of propagation, by seed, of all plants which are surviving after the weaker ones have been killed.

In order to obtain actual figures bearing out the truth of the above statement, nine lots of red clover were sown in 1913. Each lot was sown in two plots and also in rows. One of the plots of each variety was cut for hay, the yield obtained indicating its hay producing capacity. The second plot of each variety was allowed to go to seed. The seed thus obtained will be used in 1915 for plots laid out and handled in the same way and for the same purpose as those referred to above.

Each variety was also sown in rows for the purpose of determining the actual percentage of the plants killed during the first years.

The results will be seen from the following table. They show that the hardiness, as determined by the number of surviving plants in the rows, varies from 53·6 to 2·1 per cent, *i.e.*, that the degree of hardiness is very different for the different lots. The figures also show that, roughly, the yields recorded from the hay plots are fairly proportionate with the percentage of hardiness as found in the corresponding rows. In other words, that the yield of a variety of red clover is, to a certain extent at least, associated with its hardiness.

RED CLOVER—Test Plots, 1914.

Plot Number.	Hay Plots—Yield per Acre. First Cutting. Green. Ton	Lb.	Dry. Ton	Lb	Date.	Second Cutting. Green. Ton	Lb.	Dry. Ton	Lb.	Date.	Total. Green. Ton	Lb.	Dry. Ton	Lb.	Seed Plots. Yield per Acre. Lb.	Rows for Determination of Hardiness. Number of Plants in Rows. Fall 1913.	Spring 1914.	% Hardy
1	7	1700	2	200	July 1	5	1800	1	900	Sept. 3	13	1500	3	1100	266	622	333	53·6
3	7	700	1	1700	June 22	5	300	1	500	Aug. 31	12	1000	3	200	160	596	308	51·7
6	6	1300	1	1900	" 22	4	1900	1	300	" 31	11	1200	3	200	153	600	97	16·2
4	7	200	1	1700	" 22	5	00	1	400	" 31	12	200	3	100	160	640	221	34·5
2	5	1700	1	900	" 22	4	1700	1	400	" 31	10	1400	2	1300	122	589	214	36·3
5	5	1300	1	1000	" 22	4	1700	1	300	" 31	10	1000	2	1300	170	574	136	23·7
7	5	600	1	800	" 22	5	00	1	200	" 31	10	600	2	1000	100	562	81	14·4
8	1	1800	0	800	" 22	1	200	0	400	" 31	3	00	0	1200	128	464	27	5·8
9	0	1000	0	200	" 22	0	00	0	00	....	0	1000	0	200	60	432	9	2·1
Average	5	700	1	800	....	4	177	0	1933	....	9	877	2	733				

Breeding for increased yield.—With a view to the production of superior morphological strains, of known pedigree, 36 crosses were made between apparently superior plants. Fourteen of the crosses were made between plants that blossomed rather late in the season, and may be considered as capable of producing only one reliable crop of hay in a season. A variety having this characteristic would, it is thought, prove more satisfactory for mixing with timothy than the ordinary red clover which is usually nearly ripe, and of greatly reduced feeding value, when the timothy is in a proper state for hay. It should also prove very useful for districts where only one crop is possible in a season, for owing to its lateness, it would have a longer growing period than the ordinary commercial red clover.

The other twenty-two crosses were made on the second growth of plants that had produced a satisfactory first crop, and, at the time, gave evidence of producing an equally satisfactory second crop. Of the advantages of a variety having this character nothing need be said, as that is what red clover is expected to do, but which it rarely accomplishes.

For further breeding work 29 lots, numbering in all 1,000 individual plants, were transplanted to the field during the season. Each of these lots represents the progeny of a single plant which was itself a selected individual from the progeny of a single plant which grew in 1911. The final results of this breeding work have not yet been arrived at.

GRASSES.

Timothy.—In 1913, seventeen timothy plants were selected from about 1,200 individuals, planted in 1911. They were self-fertilized, and the seed thus obtained sown separately in pots. In 1914, 65 plants were secured from each of the 17 seed lots and transplanted into the field to be tested on uniformity.

As the transplanting was done during early August, the plants were not very large at the close of the season. Yet, a certain uniformity in general appearance and resistance to drought and rust was evidenced by some of the lots. Although final, *i.e.*, perfectly uniform varieties, have not yet been secured, yet a quite conspicuous uniformity is being displayed by some of the "strains" worked on.

OTTAWA.

For further breeding work, 18 plants showing especially desirable characteristics were selected from the individuals obtained in 1913. They were isolated and self-fertilized and yielded a good quantity of seed.

Orchard Grass.—During 1913 seed was obtained by self-fertilization from several of the best plants of Orchard grass transplanted to the field in 1912. Owing to lack of space, seed from only eight of these plants could be used in 1914, and from each lot of seed only 30 plants were obtained. These eight lots were transplanted to the field during August, and for the balance of the season made a very creditable growth.

Western Rye Grass.—Three lots of 40 plants each, of Western Rye grass, were transplanted to the field during July. Each of these lots was grown from the seed of a single plant of a superior type and will next year, it is hoped, furnish material for breeding work of a nature similar to that under way with timothy and orchard grass.

Reed Fescue (Festuca arundinacea Schreb).—During 1912 attention was called by the Superintendent of the Experimental Farm, Agassiz, B.C., to a variety of fescue, said to furnish splendid forage, relished very much by cattle. The fescue in question was identified as Reed fescue, a close relative of Meadow fescue, and sometimes confused with it. A sample of seed was secured from Agassiz and sown early in the season of this year. During July, 200 young seedlings were selected and transplanted into the experimental field for further study.

Red Top.—Seed from 22 Red Top plants, showing desirable characteristics, was harvested during the past season. Individual plants will be secured next year from these seed lots and a course of breeding work similar to that adopted with other grasses followed.

BROOM CORN.

Experiments with Broom Corn similar to those reported on for 1913, were laid out in the spring of 1914. The very dry weather, however, at the time of planting delayed germination to such an extent that the crop was practically a failure and of no experimental value.

HERBARIUM.

It was reported last year that for the proper understanding of the nature of a great number of Canadian grasses and sedges, a collection of European material for comparison was found necessary.

In order to obtain such materail arrangements were made to secure, through exchange, a representative collection of grasses and sedges from Northern Europe. In accordance herewith about one thousand sheets of duplicates, belonging to the Division of Forage Plants, were sent to Europe for exchange.

So far, the Division has received, in return, about 800 sheets of European sedges and grasses.

EXHIBITION MATERIAL.

Special attention has this year been paid to the collection of grass material for exhibition purposes. Through the able co-operation of Mr. W. Herriot, Galt, Ont.; Mr. Norman Criddle, Treesbank, Man.; and F. S. Browne, B.S.A., Assistant to Dominion Agrostologist, not less than 1,400 exhibition specimens, representing over 200 species and forms have been secured. A great number of these are to be exhibited at the Panama Pacific Exhibition in San Francisco, Cal. The balance of the specimens, added by a large number of small sheaves, chiefly representing agricultural grasses, will be used for various exhibits of an educational character throughout the Dominion

OTTAWA.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

CHARACTER OF SEASON.

The spring of 1914 was fully one week later than usual. During the winter the snow lay deep on the ground and did not disappear until the end of February. A period of extreme cold occurred in that month. The weather of March was mild but did not continue, April and the first half of May being, on the whole, very cool.

The clover, which appeared to have wintered well, remained apparently dormant throughout the spring, and made such a slow start that the grasses in many fields overshadowed it, and even the favourable showers of June failed to restore its early promise of a heavy crop. The corn germinated well but there were no hot days in June to push it forward. The frequent showers made all root seeds germinate well but they also rendered the control of weeds difficult. Haying was commenced on the 15th of July but did not become general until the first week in August. July and August were very favourable for plant growth. The corn stretched upward and the roots formed quickly. The first and third weeks in September were very hot and dry, the thermometer rising several degrees higher than at any previous time in the summer. The first frost occurred October 7th but was not severe enough to injure mangels. October was dry so that turnips, carrots and sugar beets did not make their usual heavy autumn growth.

INDIAN CORN.

A light coat of manure was applied to the land in the spring and ploughed under. After the soil had been given a thorough top working the corn was put in with the potato planter in rows three feet apart. Before planting the corn was soaked with lead arsenate which prevented the birds from doing any damage. The corn was planted June third and harvested October second. The yields were computed from one-hundredth acre plots. Of the nine varieties tested six were entirely new to this district.

Indian Corn for Ensilage—Test of Varieties.

No.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when cut.	Weight per acre grown in rows.	
				Inches.		Tons.	Lb.
1	Early Longfellow..........	June 4 ...	Oct. 2....	87	Tasselled........	18	1560
2	Salzer's North Dakota...	" 4.....	" 2.....	84	Late milk	18	1080
3	King Philip	" 4.....	" 3. ...	86	Early milk	18	60
4	Wisconsin No. 7............	" 4....	" 2....	95	Tasselled........	16	1960
5	Canada Yellow............	" 4.....	" 3.....	54	Ripe	15	60
6	Bailey...........	" 3.....	" 2....	93	Tasselled.......	14	560
7	White Cap Yellow Dent....	" 3.....	" 2	99	"	13	1960
8	Golden Glow....	" 3.....	" 2.....	100	"	13	1060
9	Free Press	" 4. ...	" 3....	52	Late milk......	5	800
	Average	....	....	....	....	14	1893

FIELD ROOTS.

The chief variety tests of turnips and mangels were carried on under field conditions on Rotation F, section C, of the area set aside for cereals. The test plots of carrots and sugar beets were near the pear orchard in the Horticultural division. The cut-worms were very numerous and caused about 7 per cent damage to the mangel crop. The carrot rust fly was also very injurious. Both these pests were largely controlled by preventative measures. The poisoned bran used destroyed great numbers of the cut-worms and by spraying the young carrot plants and the ground about them with strong tobacco water the carrot rust fly was prevented from laying eggs near the plants. As the losses incurred among all the varieties were in about equal proportions the loss is not considered in the following records.

TURNIPS.

Fifteen varieties of turnips were sown on June 8 on one-hundredth acre plots. Manure at the rate of twenty tons per acre was disced into the sandy loam soil. The seed was sown in drills thirty inches apart. The young plants were thinned to fourteen inches apart in the drills and hand hoed twice. The varieties were pulled on October 29th.

TURNIPS—Test of Varieties.

No.	Name of Variety.	Description of Variety.	Yield per Acre		Yield per Acre	
			Ton.	Lb.	Bush.	Lb.
1	Good Luck	Purple oblong	30	1,000	1,016	40
2	Perfection	" round	29	750	979	10
3	Mammoth Clyde	Bronze "	29	700	978	20
4	Webb 1913	Purple "	28	1,800	963	20
5	Magnum Bonum	" oblong	28	350	939	10
6	Halewood's Bronze Top	Bronze "	27	1,700	928	20
7	Hall's Westbury	Purple round	26	1,450	890	50
8	Bangholm	" oblong	26	300	871	40
9	New Century	" round	25	550	842	30
10	Hazard's Improved	Bronze oblong	25	550	842	30
11	Hartley's Br nze Top	"	24	1,000	816	40
12	Canadian Gem	Purple round	23	1,950	799	10
13	Lapland	Bronze "	23	850	780	50
14	Jumbo	Purple oblong	22	100	735	00
15	Hazard's Improved	Bronze "	18	200	603	20
	Average		25	1,950	865	50

Four of the above mentioned varieties of turnips were sown on Rotation 4, section A and yielded as follows:—

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Good Luck	29	500	975	00
2	Magnum Bonum	29	500	975	00
3	Hazard's Improved	28	1,000	950	00
4	Perfection	27	1,000	916	40
	Average	28	1,250	954	10

The average of the same varieties grown on Rotation E, section C, was 28 tons 663 pounds or 944 bushels 23 pounds.

CHARLOTTETOWN.

MANGELS.

Fourteen varieties of mangels were sown on May 21 under similar conditions to those mentioned for turnips. They were thinned to about 12 inches apart in the row. The mangels were pulled on October 17.

MANGELS.—Test of Varieties.

No.	Name of Variety.	Description of Variety.	Yield per Acre.			
			Ton.	Lb.	Bush.	Lb.
1	Giant Yellow Globe	Globe	26	50	867	30
2	Danish Sludstrup	Yellow Intermediate	26	00	866	40
3	Weibull's Danish Yellow	" "	24	1,800	830	00
4	Danish Yellow Tankard	" "	24	1,230	820	30
5	Yellow Leviathan	" "	24	500	808	20
6	Prize Mammoth Long Red	Long Red	24	00	800	00
7	Giant Yellow Intermediate	Yellow Intermediate	23	1,000	783	20
8	Weibull's Mammoth Long Red	Long Red	22	200	736	40
9	Selected Yellow Globe	Globe	21	1,350	722	30
10	Perfection Mammoth Long Red	Long Red	21	1,000	716	40
11	Gate Post	"	20	1,000	683	20
12	Weibull's Red Tankard	Red Intermediate	19	200	636	40
13	Mammoth Long Red	Long Red	18	500	608	20
14	Giant Half Sugar White	White Intermediate	17	1,500	591	40
	Average		28	881	748	1

Ten of the above varieties were sown May 22 on Rotation A 4, and yielded as follows:—

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Giant Yellow Globe	28	1,500	958	20
2	Mammoth Long Red	28	1,000	950	00
3	Danish Sludstrup	27	00	900	00
4	Prize Mammoth Long Red	27	00	900	00
5	Perfection Mammoth Long Red	26	1,500	891	40
6	Giant Yellow Intermediate	26	100	868	20
7	Yellow Leviathan	26	00	866	40
8	Selected Yellow Globe	26	00	866	40
9	Gate Post	25	00	833	20
10	Giant Half Sugar White	17	100	568	20
	Average	25	1,620	860	20

The average of the same varieties grown on Rotation F, section C, was 22 tons 690 pounds or 744 bushels 50 pounds.

CARROTS.

Five varieties of carrots were sown on May 22, and pulled October 30. They were sown in rows fifteen inches apart and the young plants were thinned to about three inches apart in the row.

CARROTS.—Test of Varieties.

No.	Name of Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Improved Short White	17	200	570	00
2	White Belgian	15	1,800	530	00
3	Mammoth White Intermediate	15	00	500	00
4	Giant White Vosges	14	1,800	496	40
5	Ontario Champion	12	1,800	430	00
	Average	15	320	505	20

SUGAR BEETS.

Four plots of sugar beets were sown May 22 and harvested November 7, 1914. They were sown in rows 30 inches apart and thinned to about 8 inches apart in the rows. The soil, a sandy loam, received a light dressing of manure and was therefore in good condition.

SUGAR BEETS.—Test of Varieties.

No.	Name of Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Vilmorin's Improved A	15	1,000	516	40
2	Klein Wanzleben	14	1,500	491	40
3	French Very Rich	13	1,500	458	20
4	Vilmorin's Improved B	12	1,500	425	00
	Average	14	375	472	55

CHARLOTTETOWN.

CLOVER, ALFALFA AND GRASSES.

The cool backward spring retarded the growth of the clovers and grasses. In many meadows, however, the grasses won out under the handicap and good crops of mixed hay were saved from all of the fields on the farm. The following records are taken from the farm rotations.

FIELD CROPS OF HAY.

Class of Hay.	Field.	Preceding Crop.	Acreage.	Yield per Acre.	
				Ton.	Lb.
Clover	C.1	Oats	0·57	2	1,947
Mixed Hay	G.2	"	0·4	2	1,862
"	G.4	Hay	0·4	2	1,362
"	G.5	"	0·4	2	1,300
Clover	A.1	Oats	1·0	2	1,260
Mixed Hay	G.3	Hay	0·4	2	1,237
"	A.2	"	1·0	2	410
Clover	D.1	Wheat	1·0	2	300
Mixed Hay	C.2	Hay	0·57	1	1,588
"	B.1	Wheat	1·0	1	1,600
Mixed Daisy Hay	F.1	"	0·86	1	546
" "	B.3	Oats	1·0	0	1,950
Average				2	447

VARIETY TEST OF GRASSES AND CLOVERS.

A number of grasses and clovers were sown in duplicate and triplicate.

Name of Variety.	Number of Plot.	Character of Hay.	Yield per Acre. Seed sown 1913.		Yield per Acre. Seed Sown 1912.	
			Ton.	Lb.	Ton.	Lb.
Swedish Red Clover (early)	1	Mixed hay				1680
Swedish Red Clover (late)	2	"			1	730
Swedish Alsike	3	Clover			1	40
Early Red Clover	4	Mixed hay	2	1,193	1	26
Mammoth Red Clover	5	"			1	460
Alsike Clover	6	"			1	440
White Dutch Clover	7	"			1	250
Turkestan Alfalfa	8	"			1	1,480
Alfalfa C.C. Seed	9	"			1	700
Timothy	10	Timothy			1	760
Orchard Grass	11	Grass hay				1,380
Kentucky Blue Grass	12	"	2	140	2	650
Red Top	13	"	2	1,760	1	1,750
English Rye	14	"				1,140
Grimm Alfalfa (1912)	A.	Alfalfa hay	1	1,860		
Grimm Alfalfa (1911)	B.	"	1	1,784		
Grimm Alfalfa	C.	"	1	1,260		

The averages given above are mostly from triplicate plots. In the case of the clovers and alfalfas the natural grasses very nearly took possession during the early part of the spring when the weather was cold.

Several strains of Grimm alfalfa and common alfalfa were sown in rows in 1912 for seed purposes. They did not produce any seed in 1913. They grew strong and bloomed freely but the seed failed to set.

CHARLOTTETOWN.

EXPERIMENTAL STATION, NAPPAN, N. S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

SEASONAL NOTES.

The growing season of 1914 was an unfavourable one owing to the cool weather during the spring, the very dry period in midsummer, and the cold weather and heavy rains in the fall which caused premature cessation of growth.

The snow which covered the ground very satisfactorily during the whole winter disappeared during the latter part of March. During April, the weather was very unsettled. May gave promise of much finer weather, but a change occurred during the latter part of the month and June was ushered in with flurries of snow and very low temperatures. On the night of the third the temperature dropped to 26°. Cool days with very frequent rains characterized this month. Unsettled weather began during the second week in September and continued to the end of the growing season. Dull, cold and damp weather prevailed with only occasional fine days. As a result of this the land became very wet, making the harvesting most disagreeable. Notwithstanding these unfavourable conditions, the roots were stored in perhaps even better condition than last year. Up to the 16th of October weather conditions were most favourable for harvesting, but a cold wet spell was experienced after that date and caused some delay. Quite heavy frosts were recorded during the early part of the month. Only fair progress could be made in fall ploughing as much of the land was too wet. The total precipitation was 2·46 inches. Cold wet weather prevailed throughout the first three weeks of November. The remaining part of the month was very fine and mild allowing the harvesting of the roots to be completed in fair condition. The total precipitation was 2·97 inches.

WEATHER OBSERVATIONS taken at Nappan Experimental Farm, 1914.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	
1914.	°	°	°	Inches.	Inches.	Inches.	Hours.
January	46	−19	13·5	1·30	17·00	3·00	92·40
February	42	−27	7·5	0·30	23·00	2·60	138·50
March	46	8	30·17	1·73	4·00	2·13	107·85
April	61	8	33·94	1·89	18·00	3·69	172·05
May	79	24	49·03	0·75	....	0·75	147·10
June	77	26	54·19	4·23	....	4·23	243·50
July	84	35	61·54	3·61	....	3·61	255·00
August	84	40	62·84	2·95	....	2·95	210·80
September	84	33	56·25	3·05	....	3·05	161·75
October	69	20	47·02	2·46	....	2·46	139·35
November	60	7	33·59	2·97	....	2·97	85·75
December	51	−17	20·22	1·46	....	1·46	110·15
Total for year				26·70	62·00	32·90	1884·20
Average for six years				30·83	56·74	36·71	2003·04
Total for six growing months, April to September				16·48	18·00	18·28	1190·20
Average of five years for six growing months, April to September				17·56	6·3	18·19	1298·65

INDIAN CORN FOR ENSILAGE.

Nine varieties of Indian corn were tested in duplicate test plots of 1/100 of an acre in size. The soil, a heavy clay, was treated somewhat differently from last year with apparently better results.

The field was pastured during the summer of 1913 and manure spread early in the fall at the rate of twenty tons per acre. This was ploughed under very shallowly as soon as the ground could be worked in the spring, cutaway harrowed twice and smoothing harrowed once before and twice after planting. No fertilizer was used.

The seed was sown on May 30 at the rate of twenty-five pounds to the acre. Couch grass proved to be very troublesome in the field and three hoeings and five cultivations were necessary to keep it under control. Germination took place much more quickly than last year but, later, growth was very slow owing to the unfavourable weather conditions.

The following are the results obtained:—

Indian Corn.—Test of Varieties.

No.	Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Yield per Acre.					
					1st Plot.		2nd Plot.		Average.	
				Inches.	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.
1	Wisconsin No. 7	May 30	Oct. 10	84	18	500	17	1,700	18	100
2	Salzer's North Dakota	" 30	" 10	80	17	00	15	1,500	16	750
3	King Philip	" 30	" 10	82	16	1,000	15	1,000	16	00
4	Early Longfellow	" 30	" 10	74	16	00	14	1,500	15	750
5	Golden Glow	" 30	" 10	80	14	1,000	16	00	15	500
6	White Cap Yellow Dent	" 30	" 10	80	15	500	10	1,500	13	00
7	Bailey	" 30	" 10	81	13	300	12	1,000	12	1,650
8	Canada Yellow	" 30	" 10	64	13	300	12	1,000	12	1,650
9	Free Press	" 30	" 10	56	7	1,500	7	500	7	1,000
	Average				14	1,233	13	1,300	14	267

FIELD ROOTS.

TURNIPS.

Thirteen varieties of turnips were tested in duplicate test plots of one one-hundredth of an acre in size. The soil was clay loam, ploughed the previous season immediately after the clover hay had been harvested and manured with green manure. In the spring it was cross-ploughed, cutaway harrowed twice and smoothing harrowed twice.

Seed at the rate of three pounds per acre was sown on the second of June with a Planet jr. hand drill. Two hoeings and five cultivations were given during the season, particular attention being paid to the plots immediately after heavy rains.

The roots were pulled on November 2 with the following results:—

TURNIPS—Test of Varieties.

No.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.		Average.			
		Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb
1	Good Luck..	29	500	975	00	26	00	866	40	27	1,250	920	50
2	Halewood's Bronze Top..	27	1,200	920	00	26	500	875	00	26	1,850	897	30
3	Hartley's Bronze Top ..	26	1,000	883	20	27	00	900	00	26	1,500	891	40
4	Magnum Bonum.........	29	500	975	00	24	500	808	20	26	1,500	891	40
5	Canadian Gem	29	1,500	991	40	23	1,000	782	20	26	1,250	887	30
6	Perfection.........	26	500	875	00	26	1,000	883	20	26	750	879	10
7	Hall's Westbury.........	26	00	866	40	23	1,500	791	40	24	1,750	829	10
8	Corning's Lapland..... ..	27	800	913	20	22	500	741	40	24	1,650	827	30
9	New Century	27	1,500	925	00	21	1,000	716	40	24	1,250	820	50
10	Mammoth Clyde	28	500	941	40	20	1,500	691	40	24	1,000	816	40
11	Hazard's Improved.....	27	1,000	916	40	20	1,000	683	20	24	00	800	00
12	Jumbo....	26	00	866	40	21	00	700	00	23	1,000	783	20
13	Bangholm..........	24	1,000	816	40	21	500	708	20	22	1,750	762	30
		27	769	912	49	23	846	780	46	25	808	846	48

NAPPAN.

MANGELS.

Eleven varieties of mangels were tested in duplicate test plots of one one-hundredth acre each. The soil was a clay loam and was prepared in the same way as that for turnips. It also received the same cultivation.

Seed was sown on June 2 at the rate of six pounds per acre and the roots were pulled on October 23. The plants were thinned to twelve inches apart in the rows which were twenty-eight inches apart.

The following results were obtained.

MANGELS—Test of Varieties.

No.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.		Average.			
		Ton.	Lb.	Bush.	Lb	Ton.	Lb	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.
1	Selected Yellow Globe...	15	1,700	528	20	20	1,800	696	40	18	750	612	30
2	Yellow Leviathan.......	14	500	475	00	18	1,400	623	20	16	950	549	10
3	Giant Yellow Intermediate............	13	1,600	460	00	18	1,100	618	20	16	350	539	10
4	Mammoth Long Red	15	1,200	520	00	16	1,000	550	00	16	100	535	00
5	Giant Yellow Globe.....	11	1,700	395	00	20	300	671	40	16	00	533	20
6	Prize Mammoth Long Red	11	300	371	40	19	00	633	20	15	150	502	30
7	Gate Post..............	11	400	373	20	18	00	600	00	14	1,200	486	40
8	Perfection Mammoth Long Red.......	12	200	403	20	16	500	541	40	14	350	472	30
9	Giant Half Sugar White..	13	1,400	456	40	14	1,000	483	20	14	200	470	00
10	Danish Sludstrup........	9	400	306	40	17	400	573	20	13	400	440	00
11	Golden Tankard........	9	300	305	00	16	500	541	40	12	1,400	423	00
		12	1,064	417	44	17	1,636	593	56	15	350	505	50

Field crop of mangels.—Three one-acre field lots of mangels were sown on June 4. The varieties used were Long Red, Yellow Intermediate and Yellow Globe. The soil was a clay loam and received the same cultivation, preparation and treatment as that alloted to variety tests with mangels and turnips, with the exception that the manuring was done in the spring.

The season proved to be an unfavourable one for this crop. The seed germinated very slowly and very poorly. In the case of the Yellow Globe the seed germinated so poorly that the acre had to be ploughed up and resown to turnips. The acre of Yellow Intermediate was very little better and gave very unsatisfactory returns. The Long Red field, although better than the others, also gave a light crop. This failure can be accounted for as being due to poor seed and unfavourable weather, since the soil was in as high a state of cultivation as it could be made.

The two acres of Long Red and Yellow Intermediate were harvested on October 29, and yielded as follows:—

Size of plot.	Variety.	Yield per acre.			
		Ton.	Lb.	Bush.	Lb.
1 acre..........................	Long Red..........................	11	1065	384	25
1 acre..............................	Yellow Intermediate................	5	1950	199	10

NAPPAN.

CARROTS.

Six varieties of carrots were tested in duplicate test plots one one-hundredth of an acre in size. This soil was also a clay loam receiving the same treatment as that of the other variety tests.

Seed was sown on the 2nd of June with a Planet jr. hand drill and the roots were pulled on November 2. The plants were thinned twice, the last thinning leaving them four or five inches apart in the rows which were twenty-eight inches apart. The plots received the same cultivation and care as those of turnips and mangels. Only a fair crop was realized, due to the unfavourable weather conditions.

The following were the results obtained:—

CARROTS—Test of Varieties.

No.	Name of Variety.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.		Average.			
		Tons.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.
1	Giant White Vosges	17	1000	583	20	17	700	578	20	17	850	580	50
2	Mammoth White Intermediate	16	1200	553	20	17	500	575	00	16	1850	564	10
3	White Belgian	15	500	508	20	17	1500	591	40	16	1000	550	00
4	Improved Short White........	16	00	533	20	16	1000	550	00	16	500	541	40
5	Ontario Champion...........	15	00	500		15	700	511	40	15	350	505	50
6	Half Long Chantenay.........	13	00	433	20	13	600	443	20	13	300	438	20
	Average....	15	1117	518	37	16	500	541	40	15	1808	530	8

SUGAR BEETS.

Four varieties of sugar beets were tested in duplicate test plots of 1/100 of an acre in size. The plots received the same preparation, treatment and cultivation as those of other roots. The rows were twenty-eight inches apart and the plants thinned to twelve inches in the rows.

The results were as follows:—

SUGAR BEETS.—Test of Varieties.

No.	Name of Variety.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.		Average.			
		Ton.	Lb	Bush.	Lb	Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.
1	French Very Rich..........	8	1,500	291	40	9	600	310	00	9	50	300	50
2	Vilmorin Improved B.......	7	300	238	20	9	300	305	00	8	300	271	40
3	Vilmorin Improved A......	7	200	236	40	9	200	303	20	8	200	270	00
4	Klein Wanzleben...........	7	100	235	00	8	1200	286	40	7	1650	260	50
	Average...... ...	7	1,025	250	25	9	75	301	15	8	550	275	50

NAPPAN.

ALFALFA, CLOVER AND GRASSES.

Alfalfa.—Up to the present time alfalfa has not been grown successfully at this station. It generally winter-kills during the first and second winters.

The plot seeded this year was half an acre in size; the soil a clay loam in a fair state of cultivation. The previous year half this area had grown a grain crop and the other half alfalfa. It was ploughed immediately after the crops had been harvested and half of the field subsoiled. Inoculated soil was taken from that half on which alfalfa had been grown and spread on the other half at the rate of two hundred pounds per acre. The field was then divided lengthwise and the whole seeded, one half with a nurse crop of barley and the other without. By this experiment the testing of the effect of subsoiling and of seeding with and without a nurse crop in the same experiment, was made possible.

The seeding was done during the last week of June at the rate of twenty-five pounds per acre. An excellent stand was obtained with the exception of one strip, the soil of which seemed to be too acid. The plot sown without a nurse crop made a stronger and more vigorous growth than the other. It consequently went into the winter in a much better condition. No difference could be noted between the field which had been subsoiled and that which had not been so handled.

Clovers—During the summer of 1913 five pounds of Red Clover were sown in uniform test plots 1/85 of an acre each. The soil, which was a clay loam, had grown a previous crop of grain. It was ploughed during the spring, well cultivated and a light dressing of commercial fertilizer (200 pounds per acre) harrowed in with a smoothing harrow. Seed was sown on the 10th of June.

Unfortunately all the plants were killed during the winter of 1913-14. This was, no doubt, caused by the alternate freezing and thawing which occurred during March, after the snow had disappeared.

The object of this experiment with clover is to endeavour to procure, by natural selection, varieties that will withstand the severe climate. To accomplish this, the plots were again seeded to clover.

Grasses.—Five plots of timothy were sown in duplicate sets of 1/85 of an acre each. The soil was a clay loam, receiving the same treatment as that for clover. One set of plots was set aside for hay production and another for seed production.

The following are the results obtained this season:—

Plot.	—	Yield per acre hay production.		Yield per acre seed production.
		Ton.	Lb.	Lb.
1	Timothy	2	675	
1	Timothy			250
2	Timothy	2	1,695	
2	Timothy			325
3	Timothy	2	1,950	
3	Timothy			500
4	Timothy	3	545	
4	Timothy			450
5	Timothy	3	375	
5	Timothy			400

By selecting seed, year after year, from plants which prove to be hardy it is hoped ultimately to obtain strains of clover and grasses characterized not only by increased hardiness, but likewise by increased productive power.

NAPPAN.

Timothy breeding.—Selection and isolation of superior types.

Lacombe, Alta.—A catch of clover can be had with barley as a nurse crop. (See clover in butt of sheaf.)

Red clover plots showing difference in hardiness. Plot to the right from seed grown in the Ottawa district, plot to the left from commercial seed.

Cutting Western Rye Grass and Alfalfa, Brandon Experimental Farm.

16—1916—65b.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. S. BLAIR.

The season of 1914, except during July, was favourable for the root crops. The rainfall during July was only 1·45 inches, with the result that the crops suffered a check during the month. The season was, however, relatively cool, and thus materially favoured the turnip crop. Corn did not make vigorous growth until after the middle of August, when the temperature was much more favourable. The first fall frost was on the 1st of October.

INDIAN CORN.

Eleven varieties of Indian corn were planted on June 6. The soil was a sandy loam of low fertility. The previous crop was potatoes, and the ground was ploughed after harvest in the fall. The land was manured in the spring with stable manure at the rate of 15 tons per acre. This was ploughed under, and after this the ground was levelled and commercial fertilizer made up of nitrate of soda, acid phosphate and muriate of potash containing 4 per cent nitrogen, 8 per cent phosphoric acid and 5 per cent potash, was sown broadcast, at the rate of 400 pounds per acre, and harrowed in. The seed was planted in rows 3½ feet apart at the rate of 30 pounds per acre. The yield per acre is calculated from plots of one-eightieth acre each. The crop was harvested October 2. The yields obtained were as follows:—

Indian Corn.—Test of Varieties.

No.	Name of Variety.	Height.	Condition when cut.	Yield per acre.	
		Inches.		Ton.	Lb.
1	Wisconsin No. 7	96	Silk	18	400
2	Golden Glow	97	"	17	1,600
3	Compton's Early	96	"	17	600
4	White Cap Yellow Dent	96	"	15	400
5	King Philip	90	Early milk	14	1,200
6	Longfellow	87	"	14	800
7	Early Longfellow	84	Late milk	14	00
8	Bailey	87	Silk	13	1,200
9	North Dakota	84	Early milk	12	800
10	Canada Yellow	60	Glazed	10	1,600
11	Free Press	48	Hard glazed	7	400
	Average			14	273

FIELD ROOTS

The ground on which the roots were grown was of a sandy loam texture of fair fertility. It was manured with stable manure at the rate of 20 tons to the acre the previous fall and ploughed. After having been ploughed this spring it was fertilized at the rate of 500 pounds per acre of complete fertilizer composed of nitrate of soda, acid phosphate, and muriate of potash, containing 4 per cent nitrogen, 8 per cent phosphorus, and 5 per cent potash, scattered broadcast and harrowed in after the ground was well worked up. The seed was sown on the level with the hand seed drill in rows 30 inches apart.

TURNIPS.

Fifteen varieties of turnips were sown on May 16. They were thinned to 1 foot apart. The crop was harvested October 23. The yield per acre is calculated from duplicate plots 1/32 of an acre each. The yields obtained were as follows:—

TURNIPS.—Test of Varieties.

No.	Name of Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Jumbo	33	1320	1122	00
2	New Century	32	1560	1092	40
3	Corning's Lapland	32	240	1070	40
5	Hazard's Improved	29	1400	990	00
5	Mammoth Clyde	26	1680	894	40
6	Canadian Gem	26	1680	894	40
7	Halewood's Bronze Top	26	1240	887	20
8	Purple Top Swede	25	600	843	20
9	Perfection Swede	24	1900	831	40
10	Bangholm Swede	23	1960	799	20
11	Durham Bronze Top	23	200	770	00
12	Hall's Westbury	21	1560	726	00
14	Kangaroo	21	1560	726	00
14	Magnum Bonum	21	680	711	20
15	Hartley's Bronze Top	20	1180	686	20
	Average	26	184	869	44

MANGELS.

Eleven varieties of mangels were sown May 15. They were thinned to 1 foot apart. The yield is calculated from the quantity obtained from duplicate plots 1/132 of an acre each. The yields were as follows:—

MANGELS—Test of Varieties.

No.	Name of Variety.	Yield per acre.			
		Ton.	Lb.	Bush.	Lb.
1	Giant Half Sugar White	24	660	811	00
2	Yellow Leviathan	24	140	802	20
3	Gate Post	23	1080	784	40
4	Selected Yellow Globe	23	820	780	20
5	Giant Yellow Globe	22	1480	758	00
6	Giant Yellow Intermediate	22	790	746	30
7	Mammoth Long Red	22	620	743	40
8	Prize Mammoth Long Red	21	940	715	40
9	Golden Tankard	21	770	712	50
10	Long Red	21	680	711	20
11	Danish Sludstrup	21	330	705	30
	Average	22	1119	751	59

CARROTS.

Five varieties of White field carrots were sown May 15. They were thinned to 4 inches apart. The yield is calculated from duplicate plots of one one-hundred and thirty-second of an acre each. The crop was harvested on October 22.

CARROTS—Test of Varieties.

No.	Name of Variety.	Yield per acre.			
		Ton.	Lb	Bush.	Lb
1	Mammoth White Intermediate	17	1640	594	00
2	Giant White Vosges	17	320	572	00
3	Improved Short White	14	1920	498	40
4	Ontario Champion	14	600	476	40
5	White Belgian	14	160	469	20
	Average	15	1328	522	8

SUGAR BEETS.

Four varieties of sugar beets were sown May 15. The plants were thinned to 8 inches apart. The yield was calculated from duplicate plots each one one-hundred and thirty-second of an acre. The crop was harvested on October 22. The yields obtained were as follows:—

Sugar Beets.—Test of Varieties.

No.	Name of Variety.	Yield per Acre.		Yield per Acre.	
		Ton.	Lb.	Bush.	Lb.
1	French Very Rich	16	1,700	561	40
2	Vilmorin Improved A	16	740	545	40
3	Klein Wanzleben	15	1,900	531	40
4	Vilmorin Improved B	14	250	470	50
	Average	15	1,648	527	28

ALFALFA.

A piece of ground which had been newly broken up was seeded to alfalfa June 18. The soil was a sandy loam, very uneven and in a poor state of fertility. Part of it was seeded without fertilizer and part fertilized. Part of the seed was inoculated by treating with "Farmogerm" and part not so treated. A section of the soil was also limed with ground limestone and a part left without lime. The growth this season was only fair and very uneven. There was little difference in the growth on the various plots.

Kentville.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

CHARACTER OF SEASON.

A good blanket of snow covering the ground from December 24, 1913 to April 10, 1914, protected grass and clover fairly well and prevented the frost from penetrating very deeply. April was a cold, backward month with a precipitation of 4·54 inches, which is nearly twice as much as the average for the month. In May, on the other hand, the precipitation was only one-third of the average. The whole month was cold and windy with frequent night frosts. Only a few hot days were registered. On the whole, the conditions were very favourable for soil cultivation but very unfavourable for growth. Cold weather continued throughout June and the first two weeks of July. On account of this, all forage crops made a very slow growth, with the exception of grass which came along fairly well. August and September brought splendid weather and, as a result, a fair average crop was generally obtained, especially of roots which, as is well known, make their growth mainly in the latter part of the growing season. The poorest crop was secured from Indian corn which on account of the cold weather in the earlier part of the season had made a very slow start. All crops were harvested under best possible weather conditions.

INDIAN CORN.

Field Crops.—Fourteen acres of corn were grown under ordinary field conditions. The land was sandy loam, naturally well drained. Ten of the 14 acres were in potatoes and turnips last season, three were from fall ploughed sod and one acre was in corn last year. The land was given a dressing of sixteen 35 bushel loads of horse stable manure per acre and also received 250 pounds per acre of fertilizer made up of nitrate of soda 31·25 pounds, sulphate of ammonia 31·25 pounds, acid phosphate 156·25 pounds, muriate of potash 31·25 pounds, containing 4·37 per cent nitrogen, 9·37 per cent phosphoric acid and 6·25 per cent potash.

The fourteen acres were planted with Pearce's Prolific, Wisconsin No. 7, White Cap Yellow Dent and Longfellow.

On account of the cold weather in May which prevented the ground from warming up sufficiently for the quick germination of corn, planting was not started until June 3. It was finished by June 13. Planting was performed with a two row planter which applied the fertilizer in the row. The rows were 3½ feet apart and the seed evenly distributed at the rate of half a bushel per acre.

The corn began to appear above the ground on the 18th of June and, unfortunately, attracted large flocks of crows. Corn poisoned with Rough-on-Rats was spread about plentifully and although it was all taken there did not seem to be any diminution of the numbers of crows. Strychnine, mixed in slaughter house offal, was also used and no doubt, poisoned many crows, but, in spite of all, the flocks continued to hover about. A man was therefore put on to patrol the field from dawn to dark. Before this was done, however, the crows had, in two mornings, thoroughly gone over about three acres and removed fully 75 per cent of the seed planted. The ground thus devastated by the crows was replanted, on June 22, with Compton's Early. Before being planted the seed was soaked in warm water for twelve hours.

On account of the partial removal of the seed and replanting with a different variety no record could be kept of the yields of the different varieties. The yield for the 14 acres was at the average rate of 9 tons per acre. The stalks when cut on the 1st of October were fairly well eared and their height approximately the same as that in the variety tests recorded below. The kernels had reached the early milk stage.

The corn was kept well cultivated and received one good hand hoeing to clean out mustard and couch grass. The part planted on sod was also hoed a second time to keep down the couch grass.

The total cost of labour for raising and harvesting the corn crop, cutting it, and putting it in the silo was $370.88, *i.e.,* $26.49 per acre or $2.94 per ton.

As stated above, the land was manured at a rate of sixteen 35 bushel loads of manure per acre. In addition, it received 250 pounds of fertilizer to the acre. The value of the additional fertilizer was tested in the following way.

One plot of one-fifth of an acre was given both manure and fertilizer, at the rates mentioned above. Another, of the same size, was manured only. Both plots were planted with Early Longfellow. The plot on which fertilizer was used in addition to manure yielded at a rate of 7 tons 1,764 pounds to the acre. The plot, which had received manure only yielded at the rate of 7 tons 1,090 pounds to the acre. The difference in yield between the two plots was consequently 674 pounds.

The cost of the 250 pounds fertilizer was $3.61 and the value of the increased yield of corn estimated at $3 per ton was $1.01. The fertilizer had quite a marked effect at first, and at the beginning of August the relative appearance of the two areas would have led the observer to suppose that the fertilized area would give nearly twice as much as the unfertilized one. Afterwards the growth evened up so that no difference was apparent, either in height of stalk or number and maturity of ears.

Variety Tests.—Eight varieties of corn planted separately on the 12th of June and harvested on the 5th of October yielded as per the following table:—

INDIAN CORN—Test of Varieties.

No	Variety.	Yield per Acre.	
		Ton.	Lb.
1	King Philip	16	1,638
2	Golden Glow	16	1,142
3	Bailey	15	673
4	Wisconsin No. 7	14	1,040
5	Compton's Early	14	314
6	White Cap Yellow Dent	11	578
7	Early Longfellow	10	1,780
8	Canada Yellow	8	335
	Average	13	938

FIELD ROOTS.

TURNIPS.

Turnips were sown on eight acres of land which had been in corn in 1913.

In 1913, the land was manured at the rate of eighteen 35-bushel loads of horse stable manure per acre. It also received an application of 468 pounds of fertilizer to the acre, containing 3·6 per cent nitrogen, 10 per cent phosphoric acid and 5·5 per potash. After the corn had been removed, the land was ploughed.

In the spring of 1914 the land was dragged and disc harrowed at intervals. Sixteen 35-bushel loads of horse stable manure to the acre were incorporated with the soil and, later, three hundred pounds of basic slag applied broadcast.

The land was then ridged up slightly with a potato planter, and at the same time 265 pounds of fertilizer were applied. This fertilizer was made up of 40 pounds nitrate of soda, 40 pounds sulphate of ammonia, 70 pounds bone meal, 70 pounds acid phosphate, and 45 pounds muriate of potash. This with the basic slag made 565 pounds per acre of a mixture containing approximately 3 per cent nitrogen, 10 per cent phosphoric acid and 4 per cent potash.

The ridges were then rolled and the seed sown with a hand sower at the rate of four pounds to the acre.

As will be seen from the following tables, a number of varieties were sown June 11 and 12, others June 23 and 24, *i.e.,* nearly two weeks later. The latter seeding was badly attacked by the Turnip fly, and an acre and a half was stripped so clean before it was noticed that it was harrowed up and reseeded to a purple top white turnip. The balance of the field was sprayed twice with a solution of 2 pounds arsenate of lead to 40 gallons of water, and the young turnips successfully brought past the age of destruction from the fly.

Horse cultivation began as soon as the turnips showed plainly in the rows and was given at least once each week until the tops began to cover the ground. Thinning was done when the little plants were in their fourth leaf and the plants left not closer than 12 inches apart.

TURNIPS.—Test of Varieties. Sown June 11 and 13.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Jumbo	29	725	978	45
2	New Century	28	840	947	20
3	Hazard's Improved	27	1,920	932	00
4	Kangaroo	27	1,430	923	50
5	Canadian Gem	26	1,505	891	45
	Average	28	84	934	44

TURNIPS.—Test of Varieties. Sown June 23 and 24.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Good Luck	25	460	841	00
2	Magnum Bonum	24	1,820	830	20
3	Corning's Lapland	24	785	813	5
4	Hall's Westbury	23	630	777	10
5	Bangholm	22	1,530	758	50
6	Halewood's Bronze Top	22	1,260	754	20
7	Perfection	21	1,935	732	15
8	Mammoth Clyde	21	1,645	727	25
9	Sutton's Champion	21	535	708	55
10	Hartley's Bronze Top	20	1,470	691	10
	Average	22	1,807	763	27

Ewing's Improved Purple Top White, sown on July 14, yielded at the rate of 25 tons 1,365 pounds, or 856 bushels 5 pounds, to the acre.

With a view of securing a supply of turnips for seed production in 1915, 7,295 roots of the Kangaroo variety were selected. These were carefully pulled and stored separately. Their weight, with some earth adhering, amounted to 14 tons 550 pounds.

FREDERICTON.

CARROTS.

Five varieties of carrots were grown on land which was in corn in 1913, and treated, that year, as described above for turnips. In 1914, sixteen 35-bushel loads of horse stable manure were applied and incorporated with the soil.

The carrots were thinned to four inches apart in the rows.

CARROTS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Giant White Vosges	18	265	604	25
2	Improved Short White	12	50	400	50
3	Mammoth White Intermediate	11	1,580	393	00
4	White Belgian	10	905	348	25
5	Ontario Champion	10	575	342	55
	Average	12	1,075	417	55

SUGAR BEETS.

Three varieties of sugar beets were grown on land treated similarly to that allotted to carrots.

The seed was sown on June 12, in rows 30 inches apart. They were cultivated frequently and thinned to eight inches apart in the rows. Harvesting took place on October 31.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Vilmorin Improved B	12	200	403	20
2	Vilmorin Improved A	10	1,585	359	45
3	French Very Rich	10	500	341	40
	Average	11	95	368	15

THE HAY CROP.

As yet there has been no crop of hay from a properly prepared meadow. Forty acres of old sod ground were cut over and gave an average yield of one ton per acre. Ten acres of land seeded to clover after the grain crop of last year gave one and one-quarter tons of hay per acre. The total hay crop secured from the farm was thus fifty-two and a half tons.

Two small plots were sown early in July, with seed of Ontario Variegated Alfalfa. The seed was inoculated with bacterial culture before sowing. A fairly good growth was made and nodules were formed on most of the plants examined. A part of each plot was limed at the rate of 2,000 pounds per acre and part was left without lime. No difference in growth between the limed and unlimed parts could be noticed this season. The growth was left on the ground to assist in covering the roots for winter protection. Roughly estimated, about 75 per cent of the plants were throwing vigorous shoots in the spring of 1915.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

As the Station has been in operation only a short time, well prepared land has not yet been available for experiments with forage plants. Brief notes relating to the growing of Indian corn and field roots under ordinary field conditions, may, however, be given. An experiment showing the value of inoculation of alfalfa seed prior to sowing may also be referred to.

INDIAN CORN.

Ten acres were sown to Longfellow corn on the 5th, 6th, 15th and 16th of June. On the 15th of July the average height of the corn was 18 inches. There was no perceptible difference in height between the corn sown the 5th and 6th of June and that sown later. The average height of the corn, at the date of cutting, was 6 feet and 6 inches. The total yield amounted to 82,000 pounds, or 4 tons 200 pounds to the acre.

At harvest time, 12 per cent of the ears had reached the milk stage and 40 per cent the silk stage. The balance were tasselled or merely heading out.

The experience from the last three years seems to indicate that, at present at least, the profitable growing of Indian corn in the district of St. Anne is rather questionable. In ordinary seasons, even the earliest varieties seldom reach the stage of maturity desirable for ensilage. Repeated experiments may, however, reveal the existence of varieties early enough to warrant their growing in the district.

FIELD ROOTS.

One acre and a third were sown to Magnum Bonum and Mammoth Clyde mangels. The seed was sown in drills, thirty inches apart. The yield per acre was essentially the same for the two varieties. The total returns from the field amounted to 33,276 pounds, *i.e.*, 12 tons 957 pounds per acre.

EXPERIMENTS WITH "FARMOGERM."

In order to determine the value of "farmogerm" (nitrogen collecting bacteria) and its influence on the growth of alfalfa, two plots of one-twentieth acre each were set aside and seeded to alfalfa. The seed used for one of the plots had been treated with "farmogerm," whilst the seed used on the other plot had received no such treatment.

The plot provided with inoculated seed yielded 106 per cent more hay than the plot on which non-inoculated seed had been used.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

The work with forage plants includes:

1. Variety tests with Indian corn, carrots, mangels, sugar beets and swede turnips for stock feeding.
2. Experiments with growing of seed of the above forage plants.
3. Selection and propagation of the best strains as regards yields, hardiness, and composition.

SEASONAL REMARKS.

The spring was about an average one for earliness. There was about half an inch of precipitation during the last week of May and this helped germination of field roots and Indian corn which were sown on May 27 and 29 respectively. Corn and swedes seemed to have enough moisture in June to grow well, but carrots, mangels and sugar beets suffered. The drought which lasted all through July until August 11 certainly cut down considerably the yield of the latter crops and also that of hay. The latter was a poor crop all through the district. Indian corn for ensilage and swedes, on the other hand, were above the average, the first one being helped by the warm weather of mid-summer and the other by the cool nights of the autumn. As the acreage of corn and roots was small in the district, forage has been very scarce and hay has sold higher than for many years past.

VARIETY TESTS.

The trial plots of corn and roots are all arranged in a regular three year rotation where they are followed by grain and hay. They were this year located on a rather poor but very uniform piece of sandy loam with a shaly subsoil a foot and a half down. The land was ploughed shallow soon after the hay was away from it, in 1913, manured at the rate of twenty tons per acre, cultivated three or four times during the summer, to keep down weeds and conserve moisture, and cross-ploughed in October a couple of inches deeper than at the first operation. In the spring of 1914, it was double-disced twice, and then spike-toothed harrowed. The corn was sown in hills three feet apart in all directions, whilst for roots, the land was put up in ridges 28 inches apart. The cultivator was kept going nearly each week, when the temperature permitted it. The corn was thinned to four plants per hill, whilst carrots were singled to six inches and mangels, sugar beets and swede turnips to eight inches apart in the rows. The singling of the roots was done when they were quite small, which experience has shown to be most advantageous. Corn was all cut at the same time, before any danger of frosts, and roots were pulled late, giving them all the advantage of the cool nights of October. Check rows were used on each side of the different kinds of forage crops so that the varieties of the end would not be benefited by any extra plant food, light or air. No variety was injured by disease, birds, insects or rodents.

All varieties of Indian corn and field roots were tested in duplicate on one-hundredth acre plots.

INDIAN CORN.

Nine varieties were tested: Bailey, Canada Yellow, Early Longfellow, Free Press, Golden Glow, King Philip, Salzer's North Dakota, White Cap Yellow Dent, and Wisconsin No. 7. The average yield for the lot was 22,555 pounds per acre. As is generally the case, the varieties which gave the highest tonnage were not far enough advanced to make good ensilage when it was time to cut the corn. In this category belong Golden Glow, White Cap Yellow Dent and Wisconsin No. 7. On the other hand, Canada Yellow, Free Press and King Philip were too ripe and gave a small crop. The varieties which were about right for silage, and at the same time yielded fairly well, were Bailey, Early Longfellow and Salzer's North Dakota. Of all these, Early Longfellow is the one which seems best adapted to this district.

The following table gives detail information regarding the varieties of Indian corn tried at this Station in 1914.

Indian Corn for ensilage.

No.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Yield per Acre.	
				Inches.		Ton.	Lb.
1	Wisconsin No. 7........	May 29..	Sept. 23..	90	Kernels just formed.....	16	1,250
2	Golden Glow...........	" 29..	" 23..	84	" "	13	950
3	White Cap Yellow Dent	" 29..	" 23..	72	Not quite glazed	13	350
4	Bailey	" 29..	" 23..	84	In good shape for silage.	12	1,550
5	Salzer's North Dakota..	" 29..	" 23..	66	Too ripe for silage.....	11	1,000
6	Early Longfellow	" 29..	" 23..	60	In good shape for silage.	9	1,250
7	King Philip...........	" 29..	" 33..	60	Too ripe for silage.	9	1,200
8	Canada Yellow....... ..	" 29..	" 23..	48	Absolutely ripe	8	1,350
9	Free Press.............	" 29..	" 23..	42	Absolutely ripe..	6	100
	Average	....	....	....	....	11	555

Cap Rouge.

FIELD ROOTS.

TURNIPS.

Thirteen varieties were tested: Bangholm Selected, Canadian Gem, Corning's Lapland, Good Luck, Halewood's Bronze Top, Hall's Westbury, Hartley's Bronze Top, Hazard's Improved, Jumbo, Magnum Bonum, Mammoth Clyde, New Century, Perfection. The average for all of them was 55,378 pounds per acre, with Good Luck on top, giving 64,950 pounds. The average for four years also places this variety at the head with 46,234 pounds, and it is therefore recommended to farmers of this part of the province of Quebec.

The following tables give details about the varieties of swedes tried at the Station since 1911, inclusively:—

TURNIPS.—Test of Varieties.

No.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.		Yield per Acre.	
				Ton.	Lb.	Bush.	Lb.
1	Good Luck	May 21-26	Oct. 19-24	32	950	1,082	30
2	Magnum Bonum	" 21-26	" 19-24	31	730	1,045	30
3	Mammoth Clyde	" 21-26	" 19-24	30	280	1,004	40
4	Corning's Lapland	" 21-26	" 19-24	29	1,800	996	40
5	Perfection	" 21-26	" 19-24	29	630	977	10
6	Canadian Gem	" 21-26	" 19-24	28	480	941	20
7	New Century	" 21-26	" 19-24	27	1,550	925	50
8	Hazard's Improved	" 21-26	" 19-24	26	1,900	898	20
9	Jumbo	" 21-26	" 19-24	26	880	881	20
10	Hartley's Bronze Top	" 21-26	" 19-24	25	1,230	853	50
11	Bangholm	" 21-26	" 19-24	24	1,530	825	30
12	Halewood's Bronze Top	" 21-26	" 19-24	24	730	812	10
13	Hall's Westbury	" 21-26	" 19-24	22	1,230	753	58
	Average	....	....	27	1,378	922	58

TURNIPS.—Average Yield 1911-1914.

No.	Name of Variety.	Yields. 1911.		1912.		1913.		1914		Average Yield.	
		Ton.	Lb.	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.
1	Good Luck	26	1,122	11	1,265	21	1,600	32	950	23	234
2	Magnum Bonum	24	1,344	9	1,965	23	400	31	725	22	609
3	Jumbo	23	105	14	875	21	1,400	26	875	21	814
4	Hartley's Bronze Top	22	718	15	855	21	1,700	25	1,225	21	625
5	Mammoth Clyde	22	949	11	440	20	900	30	275	21	141
6	Perfection	20	1,865	14	1,700	18	1,900	29	625	21	23
7	Hall's Westbury	19	1,321	14	1,040	23	500	22	1,225	20	22
8	Bangholm	21	1,639	12	585	16	1,750	24	1,525	18	1,875
9	Halewood's Bronze Top	22	1,874	6	1,612	18	00	24	725	18	53
10	Corning's Lapland	....		....		20	750	29	1,800	25	275
11	Hazard's Improved	....		....		22	1,450	26	1,900	24	1,675
12	New Century	....		....		21	1,300	27	1,550	24	1,425

CAP ROUGE.

MANGELS.

Eleven varieties were tested: Danish Sludstrup, Gate Post, Giant Half Sugar White, Giant Yellow Globe, Giant Yellow Intermediate, Golden Tankard, Mammoth Long Red, Perfection Mammoth Long Red, Prize Mammoth Long Red, Selected Yellow Globe, and Yellow Leviathan. The average yield for all was 17,777 pounds per acre, Yellow Intermediate being at the head with 24,550 pounds. The average, for four years also places this variety on top with 13,537 pounds. It therefore seems to be the best variety for this district.

The following tables show that mangels have always done poorly at this Station. Recent analysis of the soil by the Dominion Chemist has shown a deficiency in lime and this may have been the cause of the failure of the crop.

Mangels.—Test of Varieties.

No	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.			
				Ton.	Lb.	Bush.	Lb.
1	Giant Yellow Intermediate.......	May 23..	Oct. 13..	12	550	409	10
2	Yellow Leviathan..............	" 23..	" 13..	10	1,500	358	20
3	Danish Sludstrup	" 23..	" 13..	10	1,250	354	10
4	Giant Half Sugar White	" 23..	" 13..	10	500	341	40
5	Gate Post......................	" 23..	" 13..	9	350	305	50
6	Mammoth Long Red.	" 23..	" 13..	9	100	301	40
7	Prize Mammoth Long Red.......	" 23.	" 13..	8	1,900	298	20
8	Perfection Mammoth Long Red...	" 23..	" 13..	8	1,600	293	20
9	Selected Yellow Globe............	" 23..	" 13.	7	1,550	259	10
10	Golden Tankard...	" 23..	" 13..	6	550	209	10
11	Giant Yellow Globe.............	" 23..	" 13..	3	1,700	128	20
	Average..............	......	......	8	1,777	296	17

Mangels.—Average Yield 1911-1914.

No.	Name of Variety.	Yields. 1911.		1912.		1913.		1914.		Average Yield.	
		Ton.	Lb.	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.
1	Giant Yellow Intermediate.....	9	1,429	2	1,280	2	890	12	550	6	1,537
2	Gate Post....	7	263	0	1,485	2	860	9	350	4	1,740
3	Prize Mammoth Long Red.....	4	1,021	1	1,135	3	1,200	8	1,900	4	1,314
4	Selected Yellow Globe.........	3	553	1	1,960	2	770	7	1,550	3	1,708
5	Giant Yellow Globe.	4	18	0	1,815	2	140	3	1,700	2	1,418
6	Giant Half Sugar White.	....	....	....	....	2	1,894	10	500	6	1,197
7	Yellow Leviathan	....	....	....	....	1	1,660	10	1,500	6	580
8	Danish Sludstrup...	....	....	....	....	1	1,030	10	1,250	6	140
9	Mammoth Long Red	....	....	....	....	1	1,434	9	100	5	767
10	Perfection Mammoth Long Red	....	....	....	....	1	1,630	8	1,900	5	765
11	Golden Tankard	....	....	....	....	1	700	6	550	3	1,625
12	Yellow Intermediate..	3	941	2	1,527	....	....	....	....	3	234

CAP ROUGE.

CARROTS.

Five varieties were tried: Giant White Vosges, Improved Short White, Mammoth White Intermediate, Ontario Champion, White Belgian. The average yield was 10,350 pounds per acre. Mammoth White Intermediate came out No. 1, with 12,050 pounds. The average of four years places Improved Short White at the head with 13,962 pounds per acre and, up to the present, it seems to be the variety best adapted to this district.

The following tables give yields of all varieties tried at this Station since 1911:—

CARROTS.—Test of Varieties.

No.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.		Yield per Acre.	
				Ton.	Lb.	Bush.	Lb.
1	Mammoth White Intermediate	May 27	Oct. 26-29	6	50	200	50
2	Giant White Vosges	" 27	" 26-29	5	1,400	190	00
3	Improved Short White	" 27	" 26-29	5	100	168	20
4	Ontario Champion	" 27	" 26-29	4	1,450	157	30
5	White Belgian	" 27	" 26-29	4	750	145	50
	Average			5	350	172	30

CARROTS.—Average Yield 1911-1914.

No.	Name of Variety.	Yields. 1911.		1912.		1913.		1914.		Average yield.	
		Ton.	Lb.	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.
1	Improved Short White	10	1,202	2	1,197	9	1,350	5	100	6	1,962
2	Mammoth White Intermediate	9	118	1	1,547	10	400	6	50	6	1,529
3	Ontario Champion	7	1,034	1	1,300	10	1,700	4	1,450	6	371
4	White Belgian	9	1,429	1	887	8	1,300	4	750	6	92
5	Half Long Chantenay	7	1,497	1	1,052	6	1,500			5	683
6	Giant White Vosges					4	300	5	1,400	4	1,850

SUGAR BEETS.

Four varieties were tried: French Very Rich, Klein Wanzleben, Vilmorin A. Vilmorin B. The average for the lot was 9,200 pounds per acre and Vilmorin A was on top with 10,600 pounds.

A table is given showing the yields of 1914, but no table is offered showing average for four years because, for some reason or other—deficiency of lime in the soil or bad germination of the seed due to a lack of moisture—this crop has been practically a total failure in 1911-12-13:—

SUGAR BEETS—Test of Varieties.

No.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.			
				Ton.	Lb.	Bush.	Lb.
1	Vilmorin Improved A	May 23	Oct. 8	5	600	176	40
2	Vilmorin Improved B	" 23	" 8	5	500	175	00
3	Klein Wanzleben	" 23	" 8	5	200	170	00
4	French Very Rich	" 23	" 8	2	1,500	91	40
	Average			4	1,200	153	20

NUTRIENTS IN DIFFERENT KINDS OF FORAGE CROPS.

The live stock men will no doubt be interested to see how the digestible nutrients compare in Indian corn and roots. The following table takes in every plot used for variety tests since 1911 inclusively:—

DIGESTIBLE NUTRIENTS IN DIFFERENT FORAGE CROPS.

No.	Kind of Forage Crop.	Number of Plots.	Yield per Acre.	Dry Matter per Acre.	Digestible Nutrients per Acre.		
					Protein.	Carbo-hydrates.	Fat.
			Lb.	Lb.	Lb.	Lb.	Lb.
1	Swede Turnips	58	43,756	4,988	437·56	3,544·0	87·51
2	Indian Corn	25	17,020	3,523	170·20	2,025·0	68·08
3	Carrots	26	11,869	1,353	94·95	913·9	35·61
4	Mangels	45	9,697	882	96·97	533·0	19·39

SEED GROWING.

Seed of early varieties of Indian corn, Red clover and Swede turnips has already been grown at the Station. That seed of timothy, alfalfa, carrots, mangels and sugar beets can be grown in this district seems also reasonably sure. So far, however, no data bearing on the subject have been secured.

This year, nine lots of Red clover and Timothy were sown in duplicate plots, the object being to raise a strain perfectly suitable to the local conditions. The final

results of these experiments which involve seed growing of each lot and propagation of those plants which prove superior can not be expected until after four to six years.

The Station has, particularly during the last few years, made the observation that many of the varieties of field roots, now available commercially, are far from uniform. The correctness of the observations having been borne out by chemical analysis of the dry matter content of individual roots selected from within certain varieties, the Station is now preparing breeding work with the object of producing uniform strains having higher average dry matter content than those now available.

Representative roots of all varieties of turnips, grown at the Station, were this year sent to the Dominion Chemist for analysis. It was found that Hartley's Bronze Top and Good Luck produced the highest amount of dry matter per acre. The uniformity, as to the percentage of dry matter in individual roots of these varieties was, however, far from satisfactory. The lack of uniformity in the dry matter contest indicates that there is a possibility to produce, by proper breeding from individual roots of either variety, new varieties having a higher average dry matter content than the parental variety. A number of representative roots of either Hartley's Bronze Top or Good Luck or both will be used for breeding work next year.

CAP ROUGE.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

The season of 1914 was rather unfavourable for forage crops, especially for those which are harvested in the latter part of the season such as corn, roots and second crop alfalfa. The earlier part of the season was favourable and a good crop of alfalfa was cut. Other hay crops made a good start which the midsummer drought did not check very seriously. But the drought was very hard on corn and roots and on young seeding of grasses and clovers. The latter looked like a failure at harvest time but improved much under the influence of the fall showers.

INDIAN CORN.

Seventeen varieties of Indian Corn were tested this year. They were planted on May 21, and cut on September 11.

The weight as given in the following table is not a fair expression of the normal yielding capacity of the varieties, especially the early ones, because the hot dry weather brought on too rapid maturity and caused drying-out of the plants. The drying-out process furthermore was hastened by the occurrence of a frost on August 26.

Indian Corn.—Test of Varieties.

No.	Variety.	Condition When Cut.	Average Height.		Yield of Fodder per Acre.	
			Ft.	In.	Tons.	Lb.
1	Longfellow	Late Milk—Early Dough.	6	0	12	1,373
2	North Dakota White	" "	5	2	12	1,332
3	Golden Glow	Firm Dough	6	6	12	692
4	White Cap Yellow Dent	Early Milk	6	9	12	28
5	Minnesota No. 13	Firm Dough	6	9	11	1,919
6	Canada Yellow	Late Milk	5	11	11	1,908
7	Compton's Early	Early Dough	6	4	10	1,912
8	King Philip	Late Milk	6	4	10	916
9	Northwestern Dent	Firm Dough	5	10	10	833
10	Early Longfellow	Early Dough	5	9	9	1,131
11	Thayer Yellow Dent	Firm Dough—Ripe	5	4	8	1,264
12	Minnesota King	Firm Dough	6	2	8	19
13	August 15th	Firm Dough—Ripe	6	3	6	1,736
14	Gehu	Ripe	5	2	6	657
15	Quebec No. 28	"	5	5	5	1,993
16	Quebec Yellow	"	5	5	5	1,080
17	Press Press	"	4	9	3	1,106
		Average			9	819

The yield of Northwestern Dent, Minnesota King and August 15th was reduced somewhat on account of imperfect germination. Golden Glow, a new variety from Wisconsin, made a very good showing, being not only near the top in yield but also well advanced toward maturity. Minnesota No. 13 is another comparatively new variety that made a good showing this year. Longfellow and North Dakota White are reliable varieties and stand at the head in yield this year.

AVERAGE YIELDS.

Three of the above varieties have been grown for five years, three more have been grown for four years and the others for three. The average results for these periods are as follows:—

Variety.	Average Condition When Cut.	Average Yield per Acre.	
		Ton.	Lb.
Compton's Early (average of 5 years)	Early Milk	19	1,146
Longfellow (average of 5 years)	"	18	1,222
Northwestern Dent (average of 5 years)	Late Milk	16	1,362
North Dakota White (average of 4 years)	"	17	964
Quebec Yellow (average of 4 years)	Firm Dough	14	1,476
Gehu (average of 4 years)	"	13	289
Minnesota King (average of 3 years)	Late Milk	12	837
White Cap Yellow Dent (average of 3 years)	Early Milk	11	1,934

FIELD ROOTS.

TURNIPS.

Fourteen varieties of turnips were tested this year. None but Swede varieties were used as past trials have shown that the other types are distinctly inferior. They were sown on May 13th on well prepared summer fallow, and were harvested on October 19th. The yields were as follows:—

TURNIPS.—Test of Varieties.

No.	Variety.	Description of Variety.			Yield per Acre.			
					Ton.	Lb.	Bush.	Lb.
1	Perfection Purple Top	Purple top	Swede,	rather flat	22	1,360	756	00
2	Magnum Bonum	"	"	round	22	510	741	50
3	Invicta	Bronze	"	small	21	1,380	723	00
4	Hall's Westbury	Purple	"	round	20	1,860	697	40
5	Carter's Imperial	"	"	small	20	1,610	693	30
6	Good Luck	"	"	round	20	930	682	10
7	Lapland	Bronze	"	"	20	470	674	30
8	Prize Purple Top	Purple	"	"	20	1,060	651	00
9	Hazard's Improved Bronze Top	Bronze	"	fairly long	19	1,050	650	50
10	Halewood's Bronze Top	"	"	round	19	1,050	650	50
11	New Century	Purple	"	"	19	280	638	00
12	Bangholm	"	"	"	18	290	604	50
13	Hartley's Bronze Top	Bronze	"	fairly long	18	120	602	00
14	Canadian Gem	Purple	"	"	16	780	546	20
	Average				19	1,911	665	11

Perfection Purple Top gave the largest yield this year, and did the same last year. On the whole the variation among these varieties is small and cannot be considered as at all decisive.

BRANDON.

AVERAGE YIELDS.

Seven varieties of turnips have been tested for five consecutive years and three others for three years with the following results:—

Variety.	Average.	Average Yield per Acre.			
	Years.	Ton.	Lb.	Bush.	Lb.
Bangholm	5	25	1,405	856	45
Perfection Purple Top	5	23	1,238	787	18
Hall's Westbury	5	22	1,934	765	34
Magnum Bonum	5	22	984	749	44
Halewood's Bronze Top	5	21	1,916	731	56
Good Luck	5	20	1,220	687	00
Hartley's Bronze	5	20	318	671	58
Canadian Gem	3	24	1,750	829	10
Carter's Imperial	3	22	1,377	756	17
Hazard's Improved Bronze Top	3	20	878	681	18

MANGELS.

Thirteen varieties of mangels, including some sold as feeding sugar beets, were tested this year. They were sown on May 13th on well summer-fallowed land. Despite the drought they did well and produced an excellent crop. The results were as follows:—

MANGELS.—Test of Varieties.

No.	Variety.	Description of Variety.	Yield per Acre.			
			Ton.	Lb.	Bush.	Lb.
1	Giant Yellow Intermediate	Half, long, yellow, large amount of tops	42	590	1,409	50
2	Yellow Leviathan	Long, yellow, smooth	39	340	1,305	40
3	Giant Yellow Globe	Round, yellow	38	1,390	1,289	50
4	Selected Yellow Globe	Round, yellow very large and uniform	37	570	1,242	50
5	Prize Mammoth Long Red	Long, red, smooth	36	1,410	1,223	30
6	Windsor Red Globe	Round, red, small tops	36	1,150	1,219	10
7	Windsor Yellow Globe	Round, yellow, smooth	36	630	1,210	30
8	Royal Giant Sugar	Long, pink	35	810	1,180	10
9	Danish Sludstrup	Half long, yellow, large	33	640	1,110	40
10	Perfection Mammoth Long Red	Long, red, smooth	30	490	1,008	10
11	Giant Half Sugar White	Long, white	27	1,950	932	30
12	Gate Post	Long, red smooth	27	1,260	921	00
13	Golden Tankard	Round, yellow, smooth	23	510	775	10
	Average		34	442	1,140	42

The results with mangels and, to a lesser degree, with turnips are extremely variable from year to year. Varieties which excel in one season may do very poorly in the next. It is apparent that there is a great deal of variation in the quality and vitality of the seed obtained from year to year, and that it is more important to get good vigorous seed of any standard variety than to choose among varieties. Golden Tankard, for instance, germinated very poorly and consequently gave a low yield this year. With better quality of seed, Golden Tankard has previously often been among the best yielders.

BRANDON.

AVERAGE YIELDS.

Six varieties have been grown for five years and two others for four years with the following average results:—

Variety.	Average.	Average Yield per Acre.			
	Years.	Ton.	Lb.	Bush.	Lb.
Prize Mammoth Long Red	5	31	1,647	1,060	47
Selected Yellow Globe	5	30	1,231	1,020	31
Giant Yellow Globe	5	29	984	983	4
Perfection Mammoth Long Red	5	28	1,559	959	19
Giant Half Sugar White	5	27	38	900	38
Giant Yellow Intermediate	5	26	1,705	895	5
Gate Post	4	25	1,619	860	19
Golden Tankard	4	24	172	802	52

CARROTS.

Five varieties of carrots were grown with the following results:

CARROTS.—Test of Varieties.

No.	Variety.	Description of Variety.	Yield per Acre			
			Ton.	Lb.	Bush.	Lb.
1	Ontario Champion	Medium size, smooth	10	1,490	358	10
2	White Belgian	Large, rough, rooty	9	1,580	326	20
3	Giant White Vosges	Rooty, irregular size	8	240	270	40
4	Mammoth White Intermediate	Rather rough and rooty	7	910	248	30
5	Improved Short White	Not uniform	5	1,180	186	20
	Average		8	680	278	00

SUGAR BEETS.

Four varieties of sugar beets for the production of sugar were tested this year. The results were as follows:—

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per Acre.				Percentage of sugar.
		Tons.	Lb.	Bush.	Lb.	
1	Vilmorin's Improved "B"	22	1,420	757	00	11·01
2	Klein Wanzleben	20	1,070	684	30	11·23
3	Vilmorin's Improved "A"	19	1,290	654	50	11·28
4	French Very Rich	16	910	548	30	14·36
	Average	19	1,673	661	13	

BRANDON.

ANNUAL HAY CROPS.

A series of plots of crops suitable for the production of hay the same season as sown were put in this year. They were sown about May 24 on corn and potato land. The results expressed in tons of dry hay per acre are as follows:—

Name of Crop.	Character of Hay.	Ready to cut.	Height.	Yield per acre. 1914.		Average Yield per acre. 2 years.	
			Inches.	Ton.	Lb.	Ton.	Lb.
Oats	Good	Aug. 7	34	2	1,160	4	580
Peas and Oats	"	" 7	35	2	420	3	1,610
Hungarian Millet	Medium	" 14	32	3	780	3	390
Siberian Millet	"	" 7	37	3	00	3	100
German Millet	Very coarse	" 18	28	3	20	2	1,610
Spring Rye	Rather coarse	July 17	44	1	1,500	2	1,350
Early Fortune Millet	Very coarse	Aug. 3	36	2	40	2	1,220
Japanese Millet	"	" 18	23	2	500	2	800
Common Millet	Medium	" 7	34	2	200	2	20
Hairy Vetch or Sand Vetch	Good	" 3	28	2	180		
Common Vetch	"	" 3	28	1	1,000		
Sweet Clover	Very coarse	" 3	31	1	640		

In order to test the palatibility of the above fodders, the different varieties were fed to cattle. The same three animals were used for the test throughout. The Sand Vetch was relished most of all; the green oats were next best and were liked better than the peas and oats. The following list shows the order of palatability. It will be seen from the same that sweet clover was the least relished variety. As a matter of fact, all three animals refused to eat it. This might be partly explained by the fact that they were not accustomed to it. This explanation is, however, rather unsatisfactory as they all devoured the Sand Vetch with avidity though they had never seen it before.

ORDER OF PALATABILITY.

1st. Sand Vetch.
2nd. Green Oats.
3rd. Common Vetch.
4th. Peas and Oats.
5th. Hungarian Millet.
6th. Siberian Millet.
7th. Common Millet.
8th. Early Fortune Millet.
9th. Japanese Millet.
10th. German Millet.
11th. Sweet Clover.

It is apparent that these tests have not shown any results that would justify the farmer of Manitoba in giving up the present practice of using oats cut green as the principal substitute for hay. Sand Vetch, tried for the first time, shows some merit, but it is hard to cut as it lies flat on the ground in a tangled mass.

BRANDON.

GRASSES, CLOVERS AND ALFALFA.

Fifteen plots of alfalfas, grasses and mixtures were harvested this year. They were sown in 1913, and this is consequently their first producing year. Some clover plots were sown at the same time but failed to germinate. This is quite unusual as red clover usually does well and in fact did well under field conditions the same season. The results for 1914 and the average for three years are given herewith.

Kind of Hay Crop.	Yield per acre, 1st cutting.		Yield per acre, 2nd cutting.		Total Yield per acre, 1914.		Average Yield per acre, 3 years.	
	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.	Ton.	Lb.
Common alfalfa (Montana Seed)	2	1,920	1	1,400	4	1,320	5	00
Grimm's alfalfa (Alberta Seed)	2	1,120	1	1,960	4	80	......	......
Grimm's alfalfa (Minnesota Seed)	1	1,960	1	800	3	760	4	867
Turkestan alfalfa	2	600	1	1,120	3	1,720	4	1,597
Timothy	2	560	......	......	2	560	2	147
Western Rye grass	2	840	......	......	2	840	3	120
Brome grass	2	520	......	......	2	520	3	827
Red Top	1	1,000	......	......	1	1,000	1	1,320
Kentucky Blue grass	0	1,600	......	......	0	1,600	0	1,627
Timothy and Red clover	3	1,400	......	......	3	1,400	3	100
Timothy and Alfalfa	2	680	1	920	3	1,600	3	933
Western Rye grass and Red clover	3	1,480	......	......	3	1,480	3	947
Western Rye grass and Alfalfa	2	600	1	920	3	1,520	4	80
Timothy, Western Rye grass and Red clover	3	1,560	......	......	3	1,560	3	733
Timothy, Western Rye grass, Red clover and Alfalfa	3	880	0	1,360	4	240	3	1,393

Alfalfa excels all other hay crops in productiveness. Not much difference is apparent among the different strains of alfalfa. Alfalfa was the only fodder plant that produced any second crop in 1914.

A new set of plots of alfalfa, clovers, grasses and mixtures, was sown in 1914. These are laid out in duplicate and on a more comprehensive scale than heretofore. A good start was made in 1914, and interesting results should be available next year.

BRANDON.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, T. J. HARRISON, B.S.A.

SEASONAL CONDITIONS.

On the Indian Head Experimental Farm the weather conditions during the summer of 1914 were unfavourable for the production of good forage crops. While there was considerable moisture in the soil from the previous fall and early spring rains the absence of rain during May and June caused a very light yield of hay. This dry weather also greatly affected the root crop, causing a poor germination and a very late crop. The cut-worms also did considerable damage to the young mangels and carrots with the result that the stand was very thin. The fodder corn was the only crop which made satisfactory growth in the early part of the summer, but it was badly damaged by frost on August 9. The result was that it was put in the silo in a very immature state and that it did not make as good ensilage as the previous year.

INDIAN CORN.

The production of fodder corn is each year becoming more important. While occasionally an early frost, such as stopped the growth of the corn on August 9 this year, will cause a lighter yield and inferior quality, the farmer who is keeping any quantity of live stock cannot afford to be without it. In raising corn for fodder there are a number of points to be observed if good crops are to be obtained in all seasons. Since labour is expensive and the climate comparatively dry, it is advisable to sow the corn only on summer-fallowed land. The planting should not be done too early—sometime between the 15th of May and the 1st of June will give the best results. After the corn has appeared above the ground good cultivation is required to keep down the weeds and conserve the moisture. This can be done in the early stages of growth with the drag harrow; later a cultivator will be required.

The corn in the variety tests this season was so badly frozen on the 9th of August that a report of the yields obtained might be very misleading, the more as some of the very early maturing sorts had attained nearly their full growth, while some of the later sorts which would make the best ensilage in a normal year gave only light yields.

In the field North-Western Dent was the variety planted. The land was summer-fallow the previous year, the manure was applied on the surface of the ploughed land and disced in. It yielded as follows:—

Size of Field.	Manure applied.	Stage when cut.	Yield per acre.	
			Ton.	Lb.
6 acres	15 tons rotted	Early milk	8	401
5·50 acres	15 "	"	6	878
2 20 "	No manure	"	6	1,423

FIELD ROOTS.

The yield of field roots this season was not nearly so satisfactory as last year. This was due to the attack of cut-worms and to the extremely dry summer.

FALL TURNIPS.

The Fall Turnips gave decidedly higher yields than the Swedes, but were not good keepers. Most of them could, in fact, be kept in good condition only up to Christmas time. Where turnips are to be used as a soiling crop to supplement the pastures in the fall, the Fall turnip could be used to good advantage. The following are varieties that were tested at this Farm last season. They were planted on one-fiftieth acre plots on the 1st of June and pulled on the 15th of October.

FALL TURNIPS.—Test of Varieties.

No.	Name of Variety.	Description of Variety.	Yield per acre.		Yield per acre.	
			Ton.	Lb.	Bush.	Lb.
1	Weibull's Improved Long Yellow	Yellow Top	21	00	700	00
2	Mammoth Greystone	Purple Top	17	1,700	595	00
3	Yellow Aberdeen (Purple Top)	Purple Top	16	1,100	551	40
4	Weibull's Yellow Round Green Top	Green Top	16	1,000	550	00
5	Yellow Aberdeen (Green Top)	Green Top	14	950	482	30
6	White Globe	Purple Top	10	1,050	350	50
	Average		16	300	538	20

Weibull's Improved Long Yellow is a peculiar type of turnip, being very similar in appearance and shape to a white or yellow half long mangel.

SWEDE TURNIPS.

Seventeen varieties of Swede Turnips were tested on one-fiftieth acre plots. They were planted on June 1 and pulled on October 1. Where turnips are to be used for winter feeding this is the only type that should be grown, as they can be kept through the winter and fed until early spring. The following table will give the yield and a short description of the different sorts:—

SWEDE TURNIPS.—Test of Varieties.

No.	Name of Variety.	Description of Variety.	Yield per Acre.			
			Ton.	Lb.	Bush.	Lb.
1	Good Luck	Purple Top	14	450	474	10
2	Hartley's Bronze Top	Green Top	13	200	436	40
3	Perfection	Purple Top	12	1.250	420	50
4	Magnum Bonum	"	12	350	405	50
5	Halewood's Bronze Top	"	11	1,000	383	20
6	Mammoth Clyde	"	11	900	381	40
7	Jumbo	Dark Purple Top	11	700	378	20
8	Bangholm	Purple Top	10	650	344	10
9	Corning's Lapland	Green Top	10	400	340	00
10	Carter's Imperial	Purple Top	9	1,550	325	50
11	Invicta	Green Top	9	750	312	30
12	Prize Purple Top	Purple Top	9	500	308	20
13	Hazard's Improved	Green Top	8	1,850	297	30
14	Hall's Westbury	Purple Top	8	1,100	285	00
15	Weibull's Danish Purple Top	"	8	900	281	40
16	New Century	"	8	650	277	30
17	Canadian Gem	"	7	1,350	255	50
	Average		10	853	347	33

INDIAN HEAD.

MANGELS.

Where roots are being grown to be fed to cattle it is advisable to have a portion of the land sown with mangels as there is no danger of these tainting the milk when fed to the dairy cows. Last season fifteen varieties were in the variety test at Indian Head. They were planted in one-fiftieth acre plots on May 20 and pulled on October 1. The following table gives the yield of the different varieties:—

MANGELS.—Test of Varieties.

No.	Name of Variety.	Description of Variety.	Yield per Acre.			
			Ton.	Lb.	Bush.	Lb.
1	Mammoth Long Red.........	Long, rooty and red....,...................	15	1,200	520	00
2	Perfection Mammoth Long Red..	"	15	950	515	50
3	Prize Mammoth Long Red.....	"	15	150	502	30
4	Danish Sludstrup............	Half long, rooty and yellow..............	13	1,000	450	00
5	Yellow Leviathan..............	" "	13	850	447	30
6	Danish Yellow Tankard..........	Tankard, yellow and rooty................	12	1,400	423	20
7	Gate Post	Long, rooty and red.	12	600	410	00
8	Giant Half Sugar White.........	Long, rooty and white	12	600	410	00
9	Selected Yellow Globe...........	Tankard-shaped, smooth and yellow......	11	500	375	00
10	Giant Yellow Globe............	" "	10	1,650	360	50
11	Red Tankard..................	Tankard, red and rooty....	9	1,800	330	00
12	Golden Tankard	Tankard-shaped, smooth and orange.	9	600	310	00
13	Mammoth Long Red	Long, rooty and red.................	7	800	246	40
14	Danish Yellow Long Ovoid Mammoth	Half long, smooth and yellow..............	7	200	236	40
	Average..........	....	11	1,736	395	36

CARROTS.

The yields of field carrots on the Experimental Farm at Indian Head this season were very low because the varieties were planted within seventy-five feet of a hedge of Manitoba maple, which used a large amount of the available moisture. The yields, while low, were still comparative, and will be useful when considered in this manner. The carrots were planted on May 14 and pulled on October 14.

CARROTS.—Test of Varieties.

No.	Name of Variety.	Description of Variety.	Yield per Acre.			
			Ton.	Lb.	Bush.	Lb.
1	White Belgian..............................	Smooth White.........	5	1350	189	10
2	Giant White Vosges...........................	"	4	100	135	00
3	Ontario Champion............................	"	4	50	134	10
4	Improved Short White........................	"	3	1450	124	10
5	Mammoth White Intermediate..................	"	2	750	79	10
	Average...		3	1940	132	20

INDIAN HEAD.

SUGAR BEETS.

More interest is being taken each season in the growth of sugar beets, not only for the production of sugar, but also for fodder. Four varieties were sown on May 30, and pulled on October 14, with the following results:—

SUGAR BEETS—Test of Varieties.

No.	Name of Variety.	Description of Variety.	Yield per Acre.			
			Ton.	Lb.	Bush.	Lb.
1	Vilmorin Improved B	White medium sized	12	200	403	20
2	Klein Wanzleben	" "	11	700	378	20
3	French Very Rich	" "	11	550	375	50
4	Vilmorin Improved A	" "	10	350	339	10
	Average		11	450	374	10

GRASSES, ALFALFA AND CLOVERS.

In the early days in Saskatchewan little or no attention was given to the cultivation of hay and pasture crops. This was largely due to the fact that only a small amount of stock was kept on the average farm and that the native meadow supplied all the hay and pasture required. As the country became more thickly settled these meadows were broken up to be put under cultivation. It has, therefore, became necessary to secure the hay and pasture required from cultivated grasses and clovers. Another reason for the increased interest in these crops is that the pernicious result from an all-wheat-growing type of farming is becoming apparent. In the older districts it is now necessary to adopt methods of cultivation and crop rotation that will at least hold the weeds in check and return vegetable matter to the soil. The introduction of hay crops into the rotation seems to be one of the most effective methods of accomplishing this.

PERENNIAL GRASSES.

There are a great number of cultivated grasses, but there seems to be only five or six that are suited to western conditions, among which Western Rye, Brome, Timothy, Meadow Fescue, and Red Top are the most common. No one of these can be recommended for the whole district or for all purposes. Of them all Western Rye is probably better suited to a wider range of conditions and uses than any other. This season a number of the sorts advertised by the seed merchants in the West were planted in one-fortieth acre plots. The exceedingly dry weather prevented many from starting as well as they would in a normal year. The following is a list of the varieties planted:—

PERENNIAL GRASSES.—List of Varieties.

Sweet Vernal Grass.
Timothy.
Meadow Foxtail.
Red Top.
Creeping Bent Grass.
Tall Oat Grass.
Rhode Island Bent Grass.
Orchard Grass.
Crested Dog's Tail.
Canadian Blue Grass.
Kentucky Blue Grass.
Rough Stalked Meadow Grass.
Red Fescue.
Sheep's Fescue.
Fine-leaved Fescue.
Hard Fescue.
Meadow Fescue.
Tall Fescue.
Evergreen Meadow Grass.
Crested Fescue.
Brome Grass.
Perennial Rye Grass.
" (Dwarf).
Italian Rye Grass.
Western Rye Grass.

INDIAN HEAD.

LEGUMES.

The introduction of perennial grasses into the rotation will help to check the growth of weeds and to return fibre to the land, but will not help to return plant food to an exhausted soil. Legumes are the only plants known that will accomplish this. The bacteria which work on the roots of these plants have the power of changing the nitrogen in the air circulating in the soil into a form that can be used by the plants. There are many plants belonging to the family of leguminous plants which can be successfully grown in Southern Saskatchewan. The most important of the perennial and biennial kinds are alfalfa, red clover, alsike clover, white Dutch clover and sweet clover.

ALFALFA AND SAINFOIN.

Alfalfa is one of the oldest plants in the world but has only recently been introduced into the Northwest. It has been grown for some time in the Pacific States, but was not considered hardy enough to withstand the winter of the Canadian West. Hardy varieties have been discovered or originated, so that at the present time strains are available which can be grown at any place in Southern Saskatchewan. From previous experiments conducted at this Station it has been demonstrated that Grimm is one of the hardiest of the varieties available commercially. This season a number of the hardy strains were planted on one-fortieth acre plots. All germinated well and gave promise of thrifty growth last fall. The following is a list of the varieties sown:

Montana.
Grimm.
Province.
Cherno.
Turkestan.
Baltic.
Cossack.
Semi-palatinsk.

The alfalfa which was sown in the fields again demonstrated its ability to grow in dry seasons and to produce profitable crops of hay. Of the two varieties recorded below, two cuttings were secured, the total yield of which was as follows:—

Variety.	Acres in Field.	Year Sown.	Yield per Acre.	
			Ton.	Lb.
Turkestan	½	1907	1	640
Montana	2	1908	1	962

A sample of sainfoin, which plant in many respects is closely related to alfalfa and which is hardly inferior as regards feeding value, was secured and sown on one-fortieth acre plots.

CLOVERS.

As alfalfa and sainfoin will not produce their maximum yields until the third or fourth year after seeding, they are not very well adapted to short rotations. In rotations where the hay crop is only to be left down one or two years, the clovers can be used to greater advantage. Of the different kinds which can be grown, the Common Red clover would seem to be best adapted for this purpose. This season the following clovers were sown on one-fortieth acre plots:—

Common Red.
Mammoth Red.
Alsike.
White Dutch.
Sweet Clover.

They all seemed to make a fair growth and give evidence of a good stand next season.

INDIAN HEAD.

GRASS AND CLOVER MIXTURES.

To obtain larger yields per acre and better balanced fodder, it is sometimes advisable to sow the grasses and clovers in mixtures. A number of different mixtures are being tried out at this station. They were sown last year on one-fortieth acre plots and should give some valuable data next year. The list of the mixtures sown is as follows:—

Brome Grass and Alfalfa.
Brome Grass and Red Clover.
Western Rye Grass and Alfalfa.
Western Rye Grass and Red Clover.
Meadow Fescue and Alfalfa.
Meadow Fescue and Red Clover.
Timothy and Alsike Clover.
Timothy, Western Rye Grass and Red Clover.
Timothy, Meadow Fescue, Red Top and Alsike Clover.

ALFALFA AND CLOVER SEED PRODUCTION.

A small acreage of alfalfa and red clover planted in 1911 was harvested for seed in 1914. Part of the alfalfa was sown broadcast and part in drills, thirty inches apart. From observation it would seem that more seed was set in the alfalfa planted in drills. While only a small quantity of seed was produced, the quality was excellent and at the market price would make a profitable undertaking on any farm. The drawback with production of seed of these legumes in small quantities in the West is that it is somewhat difficult to thresh the seed properly. The quantity which can be grown in most cases would not be sufficient to justify the expense in the purchase of an alfalfa or clover huller, and it is very difficult to thresh the seed with the ordinary grain thresher. The pods are easily broken off, but the cylinder is not so arranged that it will take the seed out of the pods.

EXPERIMENTAL STATION, ROSTHERN, SASK.

REPORT OF THE SUPERINTENDENT, WM. A. MUNRO, B.A., B.S.A.

THE SEASON.

In the following table is given the precipitation in inches for the past four growing seasons from April 1 to August 15.

Month.	1911.	1912.	1913.	1914.	Average for four years.
	Inches.	Inches.	Inches.	Inches.	Inches.
April	0·86	0·67	0·26	0·63	0·61
May	2·38	2·15	1·26	1·96	1·94
June	3·55	2·81	1·87	2·00	2·56
July	2·89	5·25	3·80	1·40	3·33
Aug. 1-15	0·43	0·23	2·24	0·13	0·76
Total	10·11	11·11	9·43	6·12	9·20

It will be seen from the above table that the precipitation during the growing season of 1914 was considerably below the average of the last four years. The months of June and July, particularly, were characterized by light rainfall. As a consequence the yields of all forage crops were below the average of previous years.

VARIETY TESTS WITH FIELD ROOTS AND CORN.

Varieties of field roots and corn were grown in rows two and a half feet apart on land which had been summer-fallowed and manured in 1913. In most cases the tests were duplicated in order to offset conflicting conditions and the results computed from an average of the two plots.

INDIAN CORN.

Eleven varieties were sown on May 13. All the corn was badly frozen on August 9 which checked the growth and caused the yield to be less than it had been for four years previously. The quality was also injured.

Indian Corn.—Test of Varieties.

No.	Variety.	Height.	Yield per Acre.	
		In.	Ton.	Lb.
1	Free Press	26	7	1,640
2	Improved Squaw	34	7	630
3	Minnesota No. 13	30	6	970
4	Golden Glow	34	6	630
5	North Western Dent	26	6	400
6	Thayer White Dent	32	5	1,620
7	King Philip	32	4	490
8	Canada Yellow	21	3	370
9	Early Longfellow	24	2	580
10	White Cap Yellow Dent	24	2	470
11	Salzer's North Dakota	22	2	20
	Average		4	1,802

Two acres of Northwestern Dent corn yielded 8 tons 1,920 pounds. This was sown in rows two and a half feet apart on summer-fallow that had been manured. The yield under similar conditions in 1913 was 19 tons 1,240 pounds. The low yield in 1914 was due to the dry weather and to the frost of August 9.

FIELD ROOTS.

TURNIPS.

Twenty-one varieties were sown on May 13 in duplicate plots. They yielded as follows:—

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Carter's Imperial	22	1,250	754	10
2	Rennie's Mammoth Improved Greystone	21	1,300	721	40
3	Corning's Lapland	18	350	605	50
4	Perfection	18	320	605	20
5	Invicta	17	920	582	00
6	Hazard's Improved	16	1,250	554	10
7	Yellow Aberdeen Purple Top	16	400	540	00
8	Mammoth Clyde	15	1,850	530	50
9	Yellow Aberdeen Green Top	15	750	512	30
10	Halewood's Bronze Top	15	750	512	30
11	Hall's Westbury	14	1,900	498	20
12	Cow Horn	14	200	470	00
13	Hartley's Bronze Top	13	00	433	20
14	New Century	13	00	433	20
15	Good Luck	12	1,600	426	40
16	Magnum Bonum	12	1,120	418	40
17	White Globe	11	1,200	386	40
18	Prize Purple Top	11	1,190	386	30
19	Canadian Gem	11	360	372	40
20	Green Top	11	60	367	40
21	Jumbo	9	1,160	319	20
	Average	14	1,806	496	46

MANGELS.

The first sowing of mangels, which took place May 15, did not give satisfactory results. Owing to poor germination of the seed the plots were re-sown on June 16 and yielded as follows:—

MANGELS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Manitoba Giant Yellow	18	860	614	20
2	Mammoth Giant Long Red	15	1,850	530	50
3	Yellow Globe	15	190	503	10
4	Selected Prizetaker Yellow Globe	13	1,930	465	30
5	Eclipse	12	1,700	428	20
6	Peerless	12	10	400	10
7	Yellow Intermediate	11	360	372	40
8	Selected Golden Tankard	10	120	335	20
9	Red Intermediate	9	990	316	30
	Average	13	446	440	46

ROSTHERN.

CARROTS.

Five varieties were sown on May 13 in duplicate plots. They yielded as follows:

CARROTS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Improved Short White	4	490	141	30
2	Ontario Champion	3	1,940	132	20
3	White Belgian	3	1,430	123	50
4	Mammoth White Intermediate	3	1,040	117	20
5	Giant White Vosges	3	780	113	00
	Average	3	1,536	125	36

Under field conditions on summer-fallow that had been manured, carrots yielded 8 tons 872 pounds per acre, turnips 13 tons 1,172 pounds per acre, and mangels 37 tons 1,440 pounds per acre.

WESTERN RYE GRASS.

The main hay crop at the Station is Western Rye Grass, which is sown with a nurse crop and left in hay for the two succeeding years. The seed is sown broadcast immediately after the grain is sown and the ground harrowed and packed. The rate of seeding is fifteen to twenty pounds per acre of good seed.

The yield of hay from six acres of first year meadow was this year 1,882 pounds per acre, and from six acres of second year meadow 1,508 pounds per acre. This is the lowest yield recorded since the Station was established.

RED CLOVER.

Plots of various strains of red clover were sown in the spring of 1913. They made good growth during the season but winter-killed during the following winter. The same experiments were repeated in 1914 with the same results.

ALFALFA.

Plots of different strains of alfalfa were sown in the spring of 1914 and came through the spring of 1915 in good condition. A plot of Grimm's alfalfa was particularly good. An acre of Grimm's alfalfa seeded in 1911 yielded 1,000 pounds in 1914 and an acre of Turkestan under the same conditions yielded 980 pounds.

EXPERIMENAL STATION, SCOTT, SASK.

REPORT OF THE ACTING SUPERINTENDENT, M. J. TINLINE, B.S.A.

WEATHER CONDITIONS.

The season of 1914 was decidedly unfavourable for the production of forage crops of all kinds. The germination of seed of all varieties was very uniform, but from early June to the latter part of August, the soil was seldom dampened by rain to a depth of more than one inch. The drought was accompanied by high temperatures and hot dry winds.

INDIAN CORN.

The soil on which the Indian Corn was grown is a dark chocolate loam, very uniform and free from weeds. The field had been broken from the prairie in the summer of 1913, and well cultivated. The dry summer and the early frost on August 25, which made it necessary to harvest the crop early, materially decreased the yields.

Of the several varieties under test, Salzer's North Dakota gave the heaviest yield, with Early Longfellow second, and White Cap Yellow Dent third.

FIELD ROOTS.

The field on which the various field root crops were grown is a dark chocolate clay loam. It was broken 4 inches deep from the prairie in the summer of 1913, and well cultivated.

Notes taken on the appearance of the roots at harvest time indicate that, even where the subsoil is fairly open, it is necessary to plough deeply before attempting to grow crops of roots.

TURNIPS.

Twenty-three varieties of turnips were sown in uniform test rows on May 2. The rows were 22 inches apart, and the young plants thinned to 12 inches apart in the rows. The crop was harvested on October 13:—

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Carter's Imperial	19	1,750	662	30
2	Mammoth Greystone	18	1,500	625	00
3	White Globe	16	1,750	562	30
4	Hartley's Bronze Top	16	1,250	554	10
5	Magnum Bonum	16	1,000	550	00
6	Halewood's Bronze Top	16	1,000	550	00
7	Cow Horn	16	1,000	550	00
8	Yellow Aberdeen (Purple Top)	16	750	545	50
9	Mammoth Clyde	16	500	541	40
10	Hall's Westbury	15	1,000	516	40
11	New Century	15	1,000	516	40
12	Hazard's Improved	15	750	512	30
13	Perfection	15	500	508	20
14	Corning's Lapland	14	1,250	487	30
15	Good Luck	14	750	479	10
16	Invicta	14	00	466	40
17	Bangholm	13	1,000	450	00
18	Yellow Aberdeen (Green Top)	13	1,000	450	00
19	Jumbo	13	500	441	40
20	Canadian Gem	12	1,250	420	50
21	Green Top	11	1,500	391	40
22	White Swede	10	1,850	364	10
23	Prize Purple Top	10	500	341	40
	Average Yield	14	1,972	499	32

MANGELS.

Eleven varieties of mangels were sown in test rows on May 22, and harvested October 13.

MANGELS.—Test of Varieties.

No.	Variety.	Yield per Acre.		Yield per Acre.	
		Ton.	Lb.	Bush.	Lb.
1	Mammoth Long Red	11	1,250	387	30
2	Perfection Mammoth Long Red	11	1,250	387	30
3	Prize Mammoth Long Red	10	1,250	354	10
4	Selected Yellow Globe	10	1,250	354	10
5	Gate Post	10	500	341	40
6	Yellow Leviathan	10	500	341	40
7	Danish Sludstrup	9	1,000	316	40
8	Giant Yellow Intermediate	9	500	308	20
9	Giant Half Sugar White	9	500	308	20
10	Giant Yellow Globe	9	500	308	20
11	Golden Tankard	8	1,500	291	40
	Average	10	182	336	22

The long red varieties have produced the heaviest yields. They are, however, hard to pull, and apt to be broken in handling.

SUGAR BEETS.

Four varieties of sugar beets were sown. The drought and the compact soil caused the beets to become very fibrous rooted.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Shape.	Yield per Acre.		Yield per Acre.	
			Ton.	Lb.	Bush.	Lb.
1	Vilmorin's Improved "A"	Long	9	00	300	00
2	" Improved "B"	Med. Long	8	1,000	283	20
3	Klein Wanzleben	"	8	1,000	283	20
4	French Very Rich	Short	8	750	279	10
	Average		8	1,188	286	28

CARROTS.

Five varieties of carrots were sown in rows 28 inches apart, and thinned to 6 inches apart in the rows.

CARROTS.—Test of Varieties.

No.	Variety.	Shape.	Yield per Acre.		Yield per Acre.	
			Ton.	Lb.	Bush.	Lb.
1	White Belgian	Long	4	500	141	40
2	Mammoth White Intermediate	Med, Long	3	1,750	129	10
3	Improved Short White	Short	3	1,650	127	30
4	Ontario Champion	"	3	900	115	00
5	Great White Vosges	"	2	1,250	87	30
	Average		3	1,210	120	10

LEGUMINOUS FORAGE PLANTS AND GRASSES.

ALFALFA.

An experiment was made with the object to determine the value of inoculation. The variety used for the purpose was Grimm's alfalfa. The land allotted to the experiment had been summer-fallowed in 1912 and ploughed to a depth of ten inches with a subsoiler. Three plots were sown to alfalfa without a nurse crop as follows:—

No. 1 was inoculated with soil from an old alfalfa field.

No. 2 was not inoculated with alfalfa soil; neither was the seed sown on it treated with nitro-culture.

No. 3 was not inoculated with alfalfa soil, but the seed sown on it treated with nitro-culture.

No. of Plot.	Variety.	Yield per acre.		Method of Inoculation.
		Ton.	Lb.	
1	Grimms	1	650	Soil inoculation.
2	"	.....	1450	No inoculation.
3	"	1	640	Culture applied to seed.

The results, as shown by the above table, indicate that, to ensure the best results, inoculation, either of the seed or of the soil, should not be omitted when alfalfa is being started on land which has not grown the crop before.

CLOVERS AND GRASSES.

Twenty plots were sown with ten different lots of red clover seed in 1913. This season ten of these plots were cut for hay, and yields varying from 800 to 2,640 pounds per acre, were harvested, showing that there is quite a difference in the hardiness and productivity of the various types of red clover. The other ten plots were cut for seed. Some loss was experienced from a strong wind which blew some of the ripened clover away while drying in the coils. Small quantities of seed, however, were threshed from each plot, and this will be used to seed down other plots next year.

This season, duplicate plots of Kentucky Blue Grass, Red Top, Meadow Fescue, Orchard Grass, Timothy, Western Rye Grass and Sainfoin were sown. All grew very nicely except the Sainfoin, which failed to germinate. These plots will be used to determine the relative yields of fodder, and the amount of seed that can be harvested from the different kinds of grasses.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

On account of the very dry weather prevailing during the early part of the season of 1914, conditions were extremely unfavourable for hay crops on the dry land. On the other hand the relatively high temperatures in the early part of the season, due to the absence of rain storms, made the growth of all kinds of hay and especially of alfalfa, very rapid when irrigation water was applied. Owing to the late rains, which were comparatively abundant, the conditions were much more favourable for corn and roots than for grain. In fact, the results obtained with corn on dry land were better than usual.

The investigations with forage plants were carried on as usual both on dry land and on irrigated land. In order to avoid possibilities of seepage the experiments on the dry, or non-irrigated land, are located a good distance away from and above, the main irrigation canal. The crops experimented with on the irrigated land are irrigated in such a manner and at such time as to get the best results possible.

To avoid any confusion the report is divided into two parts. The first deals with experiments conducted on the part of the farm on which no irrigation is applied. The second part deals with experiments carried out under irrigation.

PART I.—NON-IRRIGATED OR DRY FARM.

The results obtained each season emphasized the fact that corn deserves more attention on the farms of Southern Alberta than it is receiving. Not only is it possible and much easier to obtain a good supply of roughage for stock in dry seasons than is commonly supposed, but it is also possible to make corn play a very important part in crop rotation.

To get the most satisfactory results, the land should be in a high state of cultivation. A liberal application of well rotted stable manure is a great help. As it is essential to have it well incorporated with the soil it should, if possible, be applied the previous season.

The farmer who is keeping milk cows will find a few acres of corn, well taken care of, a great aid in keeping up the milk supply during August and the early part of September, when the pastures are dry. By having it growing conveniently near his barn or corral, he can cut some each day to feed at night without much extra labour. He will be certain to be more than pleased by the increased flow of milk.

As has been mentioned, corn did particularly well the past season. Some varieties, such as Canada Yellow and White Cap Yellow Dent, ripened a few ears.

Seven varieties were tested. They were planted May 14th in rows 3 feet apart. Each variety was grown in a plot 0·08 of an acre. They were all cut September 16.

INDIAN CORN.

INDIAN CORN—Test of Varieties.

No.	Name of Variety.	Stand.	Condition when cut.	Average height.	Yield per acre.	
		%		Inches.	Ton.	Lb.
1	Salzer's North Dakota...	86	Newly formed ears....	69	13	1750
2	King Philip............	86	Late milk..............	72	13	620
3	Early Longfellow..	79	Newly formed ears....	69.5	12	1560
4	Golden Glow..	93	Small ears............	76	12	750
5	White Cap Yellow Dent.	87	Newly formed ears.....	76	11	1940
6	Canada Yellow..........	92	Dough	50	11	250
7	Free Press.	88	Late milk..............	49	8	1810
	Average........	....	....	....	12	97

FIELD ROOTS.

TURNIPS.

Although turnips respond to good cultivation, in that they delight in well prepared land, especially if an application of well-rotted manure has been given long enough before to allow it to be well worked into the land, still, they often do wonderfully well on freshly broken sod. This is a point that should be borne in mind by the new settler who has nothing but sod land the first year.

Fourteen varieties were tested. They were all sown on summer-fallow May 4. Unfortunately, however, they were destroyed by severe wind just as they came up and had therefore to be resown. This was done June 17. They were sown in rows 28 inches apart and thinned to about 10 or 12 inches apart in the rows. They were badly injured by aphids during the summer. They were pulled October 27.

TURNIPS—Test of Varieties.

No.	Variety.	Yield Per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Mammoth Greystone..................	20	1300	688	20
2	Hall's Westbury.....................	20	600	676	40
3	Perfection	13	150	435	50
4	Halewood's Bronze Top...............	12	700	411	40
5	Jumbo..............................	12	500	408	20
6	Bangholm............................	11	950	382	30
7	Green Top Sw·de.....................	11	750	379	10
8	Magnum Bonum........................	11	50	367	30
9	New Century.........................	10	1950	365	50
10	Canadian Gem	10	1300	355	00
11	Hartley's Bronze Top................	10	750	345	50
12	Corning's Lapland...................	10	750	345	50
13	Good Luck...........................	9	1800	320	00
14	Prize Purple Top....................	9	1650	327	30
	Average.............................	12	943	415	43

LETHBRIDGE.

AVERAGE YIELDS.

A number of the varieties recorded above have been grown at the Station for two years or more. Their average yield for the various periods will be seen from the following table:—

Variety.	Average.	Average Yield.			
	Years.	Ton.	Lb.	Bush.	Lb.
Hall's Westbury	6	15	1051	517	31
Hartley's Bronze Top	6	13	1261	454	21
Jumbo	5	15	492	508	12
Halewood's Bronze Top	5	13	1866	464	26
Bangholm	4	17	1419	590	19
Magnum Bonum	4	13	1184	453	4
Good Luck	4	11	1355	389	15
Perfection	4	11	821	380	21
Mammoth Greystone	3	18	1663	627	43
Corning's Lapland	2	13	1451	457	31
Prize Purple Top	2	13	93	434	53

MANGELS.

Varieties of mangels were sown as usual, but a severe wind storm occurring just after they were thinned destroyed the crop. The storm moved fine particles of soil along the surface with such force that the young plants were completely cut off.

CARROTS.

Five varieties of carrots were tested. They were sown on summer-fallowed land on May 5. The germination was slow and poor. After being thinned many of the plants were destroyed and a very thin stand was therefore obtained. They were pulled October 26.

CARROTS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb	Bush.	Lb.
1	Giant White Vosges	1	750	45	50
2	White Belgian	1	120	35	20
3	Improved Short White	1	60	34	20
4	Ontario Champion	0	1,750	29	10
5	Mammoth White Intermediate	0	1,500	25	0
	Average	1	36	33	56

SUGAR BEETS.

Five varieties of sugar beets were tested. They were sown on summer-fallow, April 30. As with the other roots, conditions were very unfavourable for obtaining a satisfactory stand. They were dug October 16.

Sugar Beets.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Klein Wanzleben	9	1,750	329	10
2	Vilmorin's Improved "B"	9	1,250	320	50
3	Vilmorin's Improved "A"	9	00	300	00
4	French Very Rich	8	1,200	286	40
5	Knight Sugar Company Selected	8	00	266	40
	Average	9	40	300	40

HAY.

The season was so dry that practically none of the fields or plots of perennial hay produced anything except the alfalfa grown in rows.

The results of the season's experiments only emphasize the conclusions given in last year's report that alfalfa must be planted in rows to allow intertillage if results are to be expected in a dry season. The distance the rows are apart appears to be an important consideration. Where the rows were less than 3 feet apart the plants did not make as much growth as could be desired. This was no doubt due to lack of moisture in the ground. It seems that a distance of 3½ feet between the rows ensures better results. This distance will also allow easy cultivation with ordinary corn machinery.

Unfortunately most of the alfalfa grown at the Station at present is planted less than 2½ feet apart. Consequently the growth was much affected by the drought.

All the alfalfa was, this year, set aside for seed production. The yield was, however, very disappointing. In some cases the pods failed to fill. The best fields yielded at the rate of 80 pounds of seed per acre on the whole. The results of the experiments with alfalfa seed raising at the Station indicate that the best results will be obtained where the alfalfa is planted in rows 3½ feet apart.

THREE PERMANENT FORAGE CROPS.

There appear, at the present time, to be only three permanent forage crops, worth considering, for dry land farms. They are Alfalfa, Western Rye Grass, and Awnless Brome Grass.

Of these, alfalfa no doubt is the superior one.

Western Rye being of a bunch grass nature and not inclined to make a thick sod is better for hay than is Brome Grass. It should be cut soon after it heads out, otherwise it is apt to become woody and unpalatable to stock.

For pasture, Awnless Brome Grass is superior. Its couch or twitch-like habit, *i.e.*, its inclination to spread rapidly from underground root stalks makes it, however, difficult to eradicate. This is especially true on rich, moist soils where it is really a most serious pest when once firmly established.

LETHBRIDGE.

PART II.—THE IRRIGATED FARM.

The yields of all kinds of forage crops on the irrigated land were very satisfactory. In fact, in some cases the results obtained were very good indeed. This was especially the case with corn. The yields of the roots were seriously affected on account of the difficulty in obtaining a stand, heavy winds drifting the soil and cutting off the young plants after they had been thinned. The yields from the alfalfa fields were good. The weather during harvest being dry, the quality of hay obtained was excellent. The yields of grasses such as Timothy, Western Rye Grass and Brome were relatively light owing to the extremely dry weather during May, when it was difficult to keep the surface of the land sufficiently moist for such shallow rooted plants.

INDIAN CORN.

As on the dry land the corn was grown for ensilage.

Thirteen varieties were tested. Part of them were planted May 13 and the balance May 27 in hills 3 feet apart each way on stubble land that had been manured the previous fall. The land was irrigated once on July 29, and the varieties cut on September 16. The yield of each variety was computed from 1/50 acre plots.

CORN.—Test of Varieties.

No.	Name of Variety.	Date of Sowing.	Stand.	Condition When Cut.	Average height.	Yield per Acre.	
			%		Inches.	Tons.	Lb.
1	North Western Dent	May 27	92	Early milk	91·5	26	200
2	Minnesota No. 13	" 27	92	Late milk	93	24	700
3	Early Longfellow	" 13	78	Some well formed ears.	82	24	50
4	Salzer's North Dakota	" 13	86	" "	91·5	23	1,150
5	King Philip	" 13	59	Early milk	88	21	900
6	Early Adams	" 27	89	"	88	18	1,700
7	Canada Yellow	" 13	92	Nearing maturity	61·5	18	1,000
8	Longfellow	" 27	92	Early milk	75·5	18	800
9	White Cap Yellow Dent	" 13	71	Milk stage	91	15	200
10	Free Press Selected	" 27	60	Near maturity	67	14	400
11	Golden Glow*	" 13	35	Early milk	93	10	650
12	Free Press*	" 13	60	Almost mature	50	9	1,400
13	Squaw*	" 13	76	" "	30	7	1,000
				Average		17	1,704

* Thinned by cutworms.

FIELD ROOTS.

TURNIPS.

Fourteen varieties of turnips were tested. They were sown April 30 on stubble land that had been manured in the fall of 1913. Unfortunately, hard winds destroyed most of the plants after they came up so that the varieties had to be partly re-sown. This was done on May 30. Aphides also did considerable damage, almost destroying the plants from the first seeding. The land was irrigated once, July 19, and the crop harvested October 15.

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Mammoth Greystone	21	750	712	30
2	Jumbo	12	500	408	20
3	Prize Purple Top	11	1,500	391	40
4	Canadian Gem	11	1,000	383	20
5	Perfection	10	1,500	358	20
6	Good Luck	10	1,000	350	00
7	Magnum Bonum	9	1,500	325	00
8	Corning's Lapland	9	500	308	20
9	Hartley's Bronze Top	7	1,750	262	30
10	Green Top Swede	7	1,500	258	20
11	New Century	7	500	241	40
12	Halewood's Bronze Top	6	1,250	220	50
13	Bangholm	6	500	208	20
14	Hall's Westbury	5	500	175	00
	Average	9	1,732	328	52

AVERAGE YIELDS.

A number of the varieties recorded above have been grown two years or more. Their average yields for the various periods are as follows:—

Variety	Average Years.	Average Yield.			
		Ton.	Lb.	Bush.	Lb.
Bangholm	6	17	1,857	597	37
Jumbo	6	17	1,703	595	3
Hall's Westbury	6	16	1,598	559	58
Hartley's Bronze Top	5	19	1,886	664	46
Good Luck	5	18	1,390	623	10
Perfection	5	18	812	614	2
Halewood's Bronze Top	5	18	714	611	54
Magnum Bonum	5	17	589	576	29
Mammoth Greystone	3	30	1,750	1,029	10
Prize Purple Top	2	20	1,125	685	25
Corning's Lapland	2	20	500	675	00

MANGELS.

Eleven varieties of mangels were tested. They were sown April 28, in rows 28 inches apart on land which had been manured the previous fall. Unfortunately, on account of lack of rain, the seed failed to germinate in due time. To ensure germination the land was irrigated on May 29. Owing to the late start, only a poor stand

was secured. The land was again irrigated on July 29. The crop was harvested on October 15 and the yield of the varieties, as recorded below, computed from one-fiftieth acre plots.

MANGELS—Test of Varieties.

No.	Name of Variety.	Stand.	Yield per Acre.			
		p. c.	Ton.	Lb.	Bush.	Lb.
1	Prize Mammoth Long Red	68	27	1,000	916	40
2	Giant Yellow Intermediate	73	27	250	904	10
3	Danish Sludstrup	70	26	750	879	10
4	Gate Post	78	26	750	879	10
5	Yellow Leviathan	70	25	1,750	862	30
6	Selected Yellow Globe	63	25	750	845	50
7	Perfection Mammoth Long Red	73	24	1,000	816	40
8	Mammoth Long Red	70	23	1,500	791	40
9	Half Sugar White	58	20	500	675	00
10	Giant Yellow Globe	58	19	750	645	50
11	Golden Tankard	50	16	500	541	40
	Average	....	23	1,773	796	13

AVERAGE YIELDS.

A number of varieties have been tested for periods ranging from two to seven years. Their average yields for the periods in question are recorded in the following table:—

Variety.	Average Years.	Average Yield.			
		Ton.	Lb.	Bush.	Lb.
Giant Yellow Intermediate	7	20	1,015	683	35
Selected Yellow Globe	7	19	1,547	659	7
Perfection Mammoth Long Red	7	19	725	645	25
Giant Yellow Globe	7	18	1,869	631	9
Gate Post	6	22	488	741	28
Prize Mammoth Long Red	6	20	928	682	8
Half Sugar White	6	20	314	671	54
Golden Tankard	3	13	1,675	461	15
Danish Sludstrup	2	23	162	769	22
Yellow Leviathan	2	22	1,088	751	28
Mammoth Long Red	2	19	1,312	655	12

LETHBRIDGE.

CARROTS.

Six varieties were tested. They were sown April 30 and, as was the case with other roots, had to be irrigated to ensure germination. They were sown on stubble land that had been manured the fall before, in rows 28 inches apart. They were thinned to about 6 to 8 inches apart in the rows. The land was again irrigated on July 29. The crop was harvested October 26.

CARROTS—Test in Varieties.

No.	Name of Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Improved Short White	19	00	633	20
2	Ontario Champion	14	1.500	491	40
3	Mammoth White Intermediate	14	500	475	00
4	White Belgian	12	1,000	416	40
5	Giant White Vosges	11	500	375	20
	Average	14	700	478	20

SUGAR BEETS.

Five varieties were tested. They were sown April 30 on stubble land that had been manured the fall before. They had to be irrigated, as was the case with the other roots. They were thinned to about 8 inches apart in the row. The land was irrigated July 29 and the crop harvested October 16.

SUGAR BEETS—Test of Varieties.

No.	Name of Variety.	Stand.	Yield per Acre.			
			Ton.	Lb.	Bush.	Lb.
1	Vilmorin Improved "A"	Very poor	7	1,250	254	10
2	Klein Wanzleben	"	7	50	234	10
3	French Very Rich	"	6	1,000	216	40
4	Vilmorin Improved "B"	"	6	600	210	00
5	Knight Sugar Co. Selected	"	4	1,000	150	00
	Average		6	780	213	00

ALFALFA.

The growing of hay on the irrigated lands in Southern Alberta is receiving more and more attention each season. This is particularly true in the Lethbridge district. Among the hays, Alfalfa will always rank first in importance.

Alfalfa is peculiarly adapted to irrigation. It produces large crops each year and is on the whole very profitable. The fact that a stand will last for many years reduces the cost of production to a minimum, the only expense attached to it being for irrigating and harvesting of the crop.

LETHBRIDGE.

To get the best results the land should be irrigated for each crop or cutting. As the yield depends entirely on the care exercised in irrigating no parts of the field should be missed and no parts over-irrigated to such an extent as to cause injury to the crop.

The average yield per acre on the Station since 1909 (the first fields were sown in 1908) of field-cured hay has been slightly over 5 tons per acre.

Some tests have been made, during the last few years, to ascertain what quantity of seed should be sown to the acre. The results, as expressed by this year's yields, are tabulated below. They are in perfect accord with results obtained during previous years.

EXPERIMENTS WITH RATES OF SEED PER ACRE.

Rate of Seed per Acre.	Size of Plot.	Yield per Acre. First Cutting.	Yield per Acre. Second Cutting.	Yield per Acre. Third Cutting.	Total Yield per Acre.	
Lb.	Acres.	Lb.	Lb.	Lb.	Ton.	Lb.
5	1	1,760	2,920	2,390	3	1,070
10	0·90	1,970	3,150	2,770	3	1,880
15	0·90	2,160	3,190	2,650	4	
20	0·93	2,170	3,360	2,980	4	510
25	0·84	2,010	3,570	2,660	4	210

The Station recommends 15 to 20 pounds of seed being used per acre. If conditions are very favourable less will do, but as alfalfa is a crop that will remain a long time on the land and one that will not thicken but rather is apt to become thinner as it becomes older, a liberal supply of seed is usually true economy. The hay from a thick stand has also finer stems and is therefore better in quality.

FIELDS OF ALFALFA.

Three fields of alfalfa yielded as follows:—

Area.	Date Cut.	Yield per Acre.	
		Ton.	Lb.
11 acres	June 18-20	1	1,740
	July 27-28	1	1,450
	September 7-9	1	570
	Total	4	1,760

Irrigated July 2, August 15, also in fall of 1913.

Area.	Date Cut.	Yield per Acre.	
		Ton.	Lb.
2·76 acres	July 3	2	710
	" 31	1	1,230
	September 22	0	1,830
	Total	4	1,770

Irrigated May 29, June 5 and July 10.

LETHBRIDGE.

Area.	Date Cut.	Yield per Acre.	
		Ton.	Lb.
2·22 acres	July 3	2	1,130
	August 7	1	1,160
	September 22	0	860
	Total	4	1,150

Irrigated May 29, June 5 and July 12.

GRASSES AND MIXTURES.

A plot of 1 acre of Western Rye Grass, seeded in 1913, was cut on July 10 and yielded 1 ton 1,565 pounds. A plot of 1 acre of Brome Grass, seeded in 1913, was cut July 10 and yielded 1 ton 285 pounds. A plot of 1 acre of Timothy, seeded in 1913, was cut July 10 and yielded 1,725 pounds. A plot of 1 acre of Timothy and Clover, seeded in 1913, was cut July 10 and yielded 1,840 pounds. A second cutting of mature clover was cut September 22, from which a small quantity of seed was obtained by threshing with an ordinary grain thresher. Before June 6, these plots were irrigated twice.

A field of Timothy and Red Clover, size 1·005 acres, was cut July 10 and yielded 1 ton and 1,004 pounds per acre. A crop of mature seed was cut September 22, yielding at the rate of approximately 60 pounds per acre.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

INDIAN CORN.

Twelve varieties of Indian corn were tested at Lacombe in 1914. The seed was planted on May 23, in hills two and a half feet apart each way. The land was ploughed out of sod in 1913, thoroughly packed, disced and harrowed in the fall and worked well in the spring before the planting of the seed. The season was favourable for corn, and the crop attained a height of about nine feet. The following table shows the varieties tested and the yield of each.

Indian Corn.—Test of Varieties.

No.	Variety.	Date Sown.	Date Cut.	Yield per Acre.	
				Ton.	Lb.
1	Golden Glow	May 29	Sept. 1	13	40
2	North Western Dent	" 29	" 1	13	40
3	Salzer's North Dakota	" 29	" 1	13	20
4	King Philip	" 29	" 1	11	70
5	Minnesota No. 13	" 29	" 1	11	70
6	Free Press	" 29	" 1	11	60
7	White Cap Yellow Dent	" 29	" 1	11	50
8	Early Longfellow	" 29	" 1	11	20
9	No. 28	" 29	" 1	11	10
10	Improved Sioux Squaw	" 29	" 1	10	70
11	Canada Yellow	" 29	" 1	10	10
12	Free Press	" 29	" 1	8	90
	Average			11	213

A block of two acres was planted with the Northwestern Dent and Longfellow varieties. This corn was sown in drills 28 inches apart and produced thirty tons of fodder, weighed green as it was being put into the silo. This yield is considerably larger than the yield of the same varieties grown in hills.

FIELD ROOTS.

An extremely heavy rain came just as the roots were showing above the surface, flooded the ground on which all the varieties of turnips, carrots and mangels were seeded and destroyed the crop on the entire area.

A two-acre block of turnips on higher ground produced forty-seven tons of roots of a splendid quality. The cost per ton placed in the root cellar was $1.27. Since this crop was grown on breaking of the previous year there were few weeds to combat, and the cost is therefore low on that account.

TIMOTHY FOR SEED AND FOR HAY.

Timothy supplied by the Central Experimental Farm was sown in the spring of 1913 in five duplicate plots. Five were cut for hay on July 29, and five for seed on August 17. Little difference was noticed in the earliness of these different strains of timothy, but the season just prior to cutting was particularly hot and may have forced all varieties abnormally.

Plot No.	Cut for Hay.	Cut for Seed.	Yield of Hay per Acre.		Yield of Seed per Acre.	
			Ton.	Lb.	Bush.	Lb.
1	July 29	August 17	3	1,200	8	50
2	" 29	" 17	3	960	13	40
3	" 29	" 17	3	960	12	40
4	" 29	" 17	3	640	15	20
5	" 29	" 17	3	480	14	30

RED CLOVER FOR HAY AND SEED.

Five selections of red clover were sown in duplicate in 1913, and were tested for hay and seed values in 1914. The quantity of the seed produced was negligible, and though there was an occasional seed the amount was so very small that it was considered not worth while to thresh. The yield of hay is shown herewith:—

Plot No.	Date Cut.	Yield per Acre.	
		Ton.	Lb.
1	July 20	1	1,440
2	" 20	1	1,440
3	" 20	2	240
4	" 20	2	1,040
5	" 20	2	960

TIMOTHY: RATE OF SEEDING PER ACRE.

An experiment to determine the proper rate of seeding of timothy per acre, with and without a nurse crop, was begun in 1913. The plots sown produced their first crop of hay in 1914. The results show an increased yield of hay when timothy is seeded without a nurse crop, but not sufficient to pay for the loss of the previous year's crop. The advantage of light seeding is demonstrated:—

TIMOTHY Without Nurse Crop.

Plots	Rate of Seeding.	Date Cut.	Total Yield.	
			Ton.	Lb.
Plot 1	5 pounds	July 29	3	480
" 2	10 "	" 29	3	80
" 3	15 "	" 29	3	800

LACOMBE.

Timothy With Nurse Crop.

Plots.	Rate of Seeding.	Date Cut.	Total Yield.	
			Ton.	Lb.
Plot 1	5 pounds	July 29	2	880
" 2	10 "	" 29	2	320
" 3	15 "	" 29	2	320

ALFALFA.

A test was begun in 1913 to determine the comparative yields of alfalfa seeded in drills 28 inches apart as compared with being sown broadcast in the usual manner. The seed used was produced by the Experimental Station, Lethbridge. In this test, as in a previous one begun several years ago, the alfalfa produced from seed from this source has proven altogether hardy.

Variety.	Grade.	How Sown.	Area.	1st Cutting, July 22.		2nd Cutting, Sept. 4.		Total Crop.	
				Ton.	Lb.	Ton.	Lb.	Ton.	Lb.
Grimm	A	Broadcast	·58 of an acre.	1	250	0	620	1	870
"	B	"	·58 "	1	330	0	980	1	1,310
				July 16.					
"	A	Drills 28 in. apart.	·58 "	0	1,310	0	1,080	1	390
"	B	" "	·58 "	0	1,470	0	1,130	1	600

PEAS AND OATS FOR FORAGE.

Each year large areas of land at this Station are devoted to the growing of peas and oats sown together at the rate of one bushel of peas and two bushels of oats to the acre. This seeding is done as soon as possible after the crop intended for threshing has been sown. Large yields of this mixture have been secured and the combination has proven very satisfactory as a forage crop. Last season one and a half acres produced nineteen tons, green weight, when weighed over the scales preparatory to being put into the silo. Whether the fodder is preserved in the silo, or whether it is cured in the shock, stacked, put through the cutting box and fed, the quality and quantity secured from a given area is satisfactory.

The results of a number of feeding trials conducted during the past winter seem, however, to indicate that the ensilage secured from the mixture cut green is superior as far as feeding value is concerned, to the fodder cured in the field and fed dry. By feeding ensilage to the dairy cows the cost of production of a pound of butter has been found to be twenty per cent less than when field cured fodder fed dry is used. Where fodder is required for dairy cattle the silo will therefore provide the most profitable means for its storing.

Whether the crop is intended for ensilage or for making field cured fodder, it should be cut when the oats are in the milk stage.

After having visited the Farm and inspected the silage as it was being fed to dairy cattle at this Station during the past winter, a number of dairymen have expressed themselves as being so favourably impressed with the advantage of the silo that they intend to provide for storing their green feed crop in this manner next year.

Lacombe.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

SEASON.

This season has been different from the average inasmuch as a very severe drought was experienced in June, July and August. The early season was sufficiently moist, and all forage crops, (except corn) made excellent growth until the latter part of June. From the end of June until the second week of September all the crops suffered from lack of moisture.

Taking the growing season as a whole, there was a generous supply of moisture (23·3 inches) but it was badly distributed, as the following table will show. There were not any very high temperatures but neither were there any frosts from May 1 until October 31.

1914.	May.	June.	July.	August.	September.	October.	Total.
Precipitation	3·55 in.	5·18 in.	0·15 in.	0·60 in.	6·29 in.	7·53 in.	23·3 in.
Sunshine	202 hrs.	176 hrs. 18 min.	246 hrs. 30 min.	224 hrs. 30 min.	60 hrs. 30 min.	111 hrs. 30 min.	1,021 hrs. 42 mins.
							Average.
Highest temp	85°	87°	87°	87°	78°	71°	82·5°
Lowest temp	36°	41°	39°	44°	40°	34°	39°
Mean monthly temp	56·28°	52·91°	62·075°	62·995°	54·23°	50·4°	56·48°

SOIL.

The soil on which the forage crops were grown this year was a sandy loam which was not very fertile. It had been in pasture in 1913 and during that season grew a very thick crop of rye grass and white clover.

MANURING.

The land upon which all the forage crops were grown was manured during the winter and early spring with 20 tons of barnyard manure per acre.

The mangels, turnips, sugar beets and carrots received, in addition, 700 pounds per acre of the following mixture:—

150 pounds muriate of potash.

100 pounds nitrate of soda.

350 pounds superphosphate.

This mixture was applied in the drills at the time of planting. The corn did not receive a dressing of commercial fertilizer.

INDIAN CORN.

Nine varieties of corn were tested this year. They were all planted on May 15 and harvested September 30, thus having a growing season (without frost) of 138 days. The yield was lighter than usual this year. One of the reasons for this was that the land was not worked in the best way prior to seeding. It was given a surface

application of manure in late winter and early spring. The sod was then spring ploughed, rolled and top-worked. With this treatment it was found most difficult to get a proper seed bed, and the crop suffered. Another reason for the low yield was that the season, as will be noticed from the weather report, was cool and dry at that time of year when corn makes its greatest growth.

The seed was planted in hills three feet apart each way. Six seeds were put to each hill, but only an average of two stalks per hill grew to maturity. This number is far from enough for a large tonnage and compares very unfavourably with the average from previous years which is four mature stalks to the hills.

Early Longfellow and Compton's Early gave as usual the best silage returns, yielding 13 tons 1,400 pounds and 13 tons 700 pounds per acre respectively. They both reached the soft dough stage in maturing. White Cap Yellow Dent yielded 500 pounds more per acre than Longfellow but the grain was only in the early milk stage. The whole crop was softer and made very watery silage. Free Press ripened and Canada Yellow was nearly ripe, but both varieties were extremely light croppers. Wisconsin No. 7 and King Philip both finished in the soft dough stage, but they were lighter croppers than Longfellow and Compton's Early. Golden Glow and Salzer's North Dakota were of very inferior quality and light yielders this year.

INDIAN CORN FOR ENSILAGE—Test of Varieties.

No.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Yield per Acre.	
				In.		Ton.	Lb.
1	Early Longfellow	May 15	Sept. 30	90	Soft dough	13	1,400
2	White Cap Yellow Dent	" 15	" 30	90	Early Milk	13	900
3	Compton's Early	" 15	" 30	88	Soft dough	13	700
4	Wisconsin No. 7	" 15	" 30	92	"	11	1,700
5	King Philip	" 15	" 30	86	"	11	1,400
6	Salzer's North Dakota	" 15	" 30	80	"	10	1,450
7	Golden Glow	" 15	" 30	84	Few ears formed	9	300
8	Canada Yellow	" 15	" 30	66	Nearly ripe	8	450
9	Free Press	" 15	" 30	58	Ripe	5	200
	Average					10	1,611

FIELD ROOTS.

TURNIPS.

Sixteen varieties of turnips were grown this year. They were planted on May 9 and harvested November 14, thus having a growing season of 189 days. The land which was in pasture last year received the preparation which, at the present time, is considered best for root crops. It was ploughed in early autumn, rolled, top-worked with disc and drag, and later in the autumn reploughed deeper than the first time. The manure was applied in early spring and worked in with the disc harrow. The land was drilled up in rows 30 inches apart. It was then rolled and the seed planted three-quarters of an inch deep at the rate of 4 pounds per acre. The stand was perfect and there was little or no trouble with the cabbage maggot. In the dry weather in August there was a very bad attack by an aphis; this scourge lasted until the rains came in September. It did a great deal of damage and the result was a smaller crop of poor quality. The aphis in nearly every case destroyed the crown, and when growth was resumed, each turnip was many headed. This season there was also quite a large percentage of rotten turnips, possibly due to the mid-summer check in growth.

AGASSIZ.

This season a variety named Perfection headed the list as the heaviest yielder with 30 tons 400 pounds per acre; it was followed closely by Hall's Westbury, which yielded 29 tons 1,900 pounds. The third variety was Bangholm, the seed of which was received through the courtesy of Mr. V. Bojesen, Victoria, B.C., from the Danish Seed Commissioner. Another variety named Fyen Bortfelder, received from the same source as the Danish Bangholm, matured early and should have been used as a fall turnip, because when harvested on November 14, it had a very large percentage of rotten roots. It is a long mangel-shaped turnip which grows very high out of the ground, and when sound shows a clean, smooth, prongless root.

TURNIPS—Test of Varieties.

No.	Name of Variety.	Yield per Acre.			
	—	Ton.	Lb.	Bush.	Lb.
1	Perfection	30	400	1,006	40
2	Hall's Westbury	29	1,900	998	20
3	Danish Bangholm	29	800	980	00
4	New Century	28	1,900	965	00
5	Hazard's Improved Green Top	28	1,800	963	20
6	Hartley's Bronze Top	28	1,800	963	20
7	Danish Green Headed Swede	28	900	948	20
8	Magnum Bonum	28	700	945	00
9	Corning's Lapland	28	500	941	40
10	Bangholm	28	400	940	00
11	Good Luck	27	1,000	916	40
12	Jumbo	27	800	913	20
13	Halewood's Bronze Top	26	1,400	890	00
14	Canadian Gem	25	1,600	860	00
15	Mammoth Clyde	23	900	781	40
16	Fyen Bortfelder	21	100	701	40
	Average	27	1,181	919	41

Taking into consideration the tests made each year at this farm, it is very hard to recommend any one variety as being the best suited for the local conditions. During the last ten years, Perfection has twice headed the list; this can also be said of Jumbo. Magnum Bonum was once first and once second; Good Luck has also been once first and once second. Kangaroo and Halewood's Bronze Top have each twice been in second place, while Carter's Elephant has the distinction of being once at the top and twice in second place, from the standpoint of gross yield per acre. This may be better illustrated in the following table:—

No.	Name of variety.	No. of times appearing as highest yielder in ten years.	No. of times appearing as 2nd highest yielder in ten years.
1	Carter's Elephant	1	2
2	Perfection	2	
3	Jumbo	2	
4	Magnum Bonum	1	1
5	Good Luck	1	1
6	Kangaroo		2
7	Halewood's Bronze Top		2

Figuring from this table it may be concluded that Carter's Elephant would be the best variety, with Jumbo and Perfection next best. However, there is room for very careful work in this particular branch of work in the near future.

AGASSIZ.

MANGELS.

Twelve varieties of mangels were grown this year. They were planted on May 8, and harvested November 12, the growing season thus being 187 days. They were planted on the same kind of soil and received the same treatment previous to planting as did the turnips; in fact all the root crops were treated alike in this respect. The mangels were planted in rows 30 inches apart and thinned to 14 inches in the rows. The seed was set about one inch deep and planted at the rate of 10 pounds per acre. Even with this amount of seed, the stand was not perfect. After the roots were an inch in diameter they were badly attacked by cutworms and as a result the crop was seriously affected. The attack of the cutworms accounts for a lighter crop this year than usually.

A certain strain of Yellow Globe gave the largest yields. This strain is always near the head of the list at this farm. The Sludstrup gave a very good yield, and roots of excellent quality were produced. The Mammoth Long Red and the Gate Post gave comparatively good yields but the crop was a rough, prongy one.

A trial was again made this year with commercial fertilizer for mangels. Three plots were used; one plot did not have any commercial fertilizer; one plot had a complete dressing of commercial fertilizer and one had a dressing of nitrate of soda and superphosphate. The results are shown in the following table.

Plot No.	Treatment.	Yield per acre.	
		Ton.	Lb.
1	No commercial fertilizer	4	60
2	Complete dressing of commercial fertilizer	25	90
3	Incomplete dressing of commercial fertilizer	22	30

More extensive and thorough work is being arranged in an endeavour to find out which fertilizer constituent is most beneficial and what quantity of fertilizers should be applied for the most profitable returns of the mangel crop in the district.

MANGELS.—Test of Varieties.

No.	Name of variety.	Yield per acre.		Yield per acre.	
		Ton.	Lb.	Bush.	Lb.
1	Giant Yellow Globe	25	1,000	850	00
2	" Intermediate	23	700	778	20
3	Danish Sludstrup	23	300	771	40
4	Prize Mammoth Long Red	22	100	735	00
5	Yellow Leviathan	21	1,600	726	40
6	Gate Post	20	1,500	691	40
7	Danish Rosted Barres	20	200	670	00
8	Perfection Mammoth Long Red	19	00	633	20
9	Mammoth Long Red	18	1,800	630	00
10	Giant Half Sugar White	18	1,600	626	40
11	Selected Yellow Globe	18	300	605	00
12	Golden Tankard	12	700	411	40
	Average	20	650	677	30

AGASSIZ.

STORAGE TEST OF MANGELS.—Stored from November 13, 1914, to April 1, 1915 (140 days).

Number of roots.	Variety.	Weight when stored.	Weight when taken out.	Unsound roots.	Per cent loss by shrinkage.	Per cent unsound roots.
		Lb.	Lb.	Lb.	p.c.	p.c.
50	Giant Yellow Intermediate	252	232	3	7·9	1·15
50	Giant Yellow Globe	272	253	2	7·0	0·7
50	Danish Sludstrup	220	199	....	9·0	....
50	Prize Mammoth Long Red	252	223	....	11·5	....
50	Mammoth Long Red	226	212	....	6·2	....
50	Gate Post	232	213	....	8·2	....
50	Selected Yellow Globe	310	260	10	16·1	3·2
50	Yellow Leviathan	269	237	....	11·9	....
50	Giant Half Sugar White	235	212	....	9·8	....
50	Perfection Mammoth Long Red	222	191	....	14·0	....
50	Golden Tankard	190	170	....	10·5	....
50	Danish Rosted Barres	238	218	5	8·4	2·0

CARROTS.

Five varieties of carrots were planted on May 8 and harvested November 14.

This season the field carrots out-yielded all other classes of field roots. The highest yielding varieties produced 32 tons 1,600 pounds per acre. On the whole the carrots grew very large and many of them cracked badly. They were therefore harvested in such condition as to make storing and keeping in a cellar difficult. The Improved Short White, although not yielding as much as Giant White or White Belgian, gave a carrot of superior quality.

CARROTS—Test of Varieties.

No.	Name of Variety.	Yield per Acre.		Yield per Acre.	
		Ton.	Lb.	Bush.	Lb.
1	Giant White Vosges	32	1,600	1,093	20
2	White Belgian	27	1,600	926	40
3	Mammoth White Intermediate	26	1,900	898	20
4	Improved Short White	25	100	835	00
5	Ontario Champion	24	900	815	00
	Average	27	820	913	40

SUGAR BEETS.

Four varieties of sugar beets were planted May 8 and harvested November 14. The highest yielder was French Very Rich, which gave 14 tons 1,900 pounds per acre. On the whole the roots were rough and the yields not satisfactory this year.

SUGAR BEETS—Test of Varieties.

No.	Name of Variety.	Yield per Acre.		Yield per Acre	
		Ton.	Lb	Bush.	Lb.
1	French Very Rich	14	1,900	498	20
2	Klein Wanzleben	12	1,700	428	20
3	Vilmorin's Improved "B"	12	200	403	20
4	" " "A"	9	1,900	331	40
	Average	12	925	415	25

EXPERIMENTAL STATION, INVERMERE, B.C.

REPORT OF THE SUPERINTENDENT, G. E. PARHAM.

CHARACTER OF SEASON.

The rainfall during the last season was above the average. Forage crops, especially corn, suffered from the unfavourable conditions in June, being retarded in their growth by the cold. The month of August was very dry but the lack of moisture was made good by a late irrigation. A frost on August 31 cut the corn foliage, but the root crops continued their growth up to the time of harvesting, viz., October 15. The rainfall in September was 2·16 inches but October was dry, and the harvest of the root crops was conducted under favourable conditions.

INDIAN CORN.

The seed was sown on June 6 on land which had grown a crop of oats in 1912, followed by vetches and rape, ploughed under, in 1913. In the spring of 1914, manure at the rate of 12 tons per acre was applied in furrows 3 feet apart. Owing to the cold winds and low temperature in June, the seed was slow in germinating, and the corn made but slow growth until the warm weather in July. No cobs matured.

During the season the land was twice irrigated, once hand-hoed and twice cultivated with a one-horse cultivator.

INDIAN CORN FOR ENSILAGE—Test of Varieties.

No.	Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Yield per Acre.	
				Inches.		Ton.	Lb.
1	Salzer's North Dakota	June 6	Sept. 8	36	Green	4	970
2	Canada Yellow	" 6	" 5	36	"	4	610
3	King Philip	" 6	" 5	36	"	3	1,770
4	Golden Glow	" 6	" 5	30	"	3	30
5	White Cap Yellow Dent	" 6	" 5	30	"	2	1,660
6	Early Longfellow	" 6	" 5	30	"	2	1,480
7	Free Press	" 8	" 8	30	"	1	870
	Average					3	484

The weights were taken after the corn had been somewhat injured by frost.

FIELD ROOTS.

Sixteen varieties of turnips, eleven of mangels, four of sugar beets and five of carrots were tested.

The treatment of the land for all these was the same. The land was ploughed in the autumn of 1913 and again ploughed, cultivated and levelled in the spring. A dressing of farm manure at a rate of 12 tons to the acre was then applied, and the land again ploughed and levelled.

TURNIPS.

The seed was sown May 19 on the flat. Plots one-sixteenth of an acre to each variety. The drills 2 feet apart and plants about 1 foot apart in the rows.

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre, 1st Plot.				Yield per Acre, 2nd Plot.				Average Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.
1	Carter's Imperial	25	1,280	854	40	18	1,620	627	00	22	450	740	50
2	Invicta	21	40	700	40	20	1,050	684	10	20	1,545	692	25
3	Hall's Westbury	19	1,270	654	30	20	130	668	50	19	1,700	661	40
4	Magnum Bonum	22	1,870	764	30	15	1,550	525	50	19	910	644	50
5	Perfection	19	1,270	654	30	18	1,880	631	20	19	575	642	55
6	Halewood's Bronze Top	21	1,430	723	50	16	870	547	50	19	150	635	50
7	Mammoth Clyde	17	1,570	592	50	20	660	677	40	19	115	635	15
8	Hartley's Bronze Top	17	1,240	587	20	18	500	608	20	17	1,870	597	50
9	Canadian Gem	19	810	646	50	15	1,680	528	00	17	1,245	587	25
10	New Century	14	400	473	20	20	1,710	695	10	17	1,055	584	15
11	Hazard's Improved	21	240	704	00	13	400	440	00	17	320	572	00
12	Bangholm	15	1,220	520	20	18	1,420	623	40	17	320	572	00
13	Corning's Lapland	15	1,550	525	50	18	890	614	50	17	220	570	20
14	Prize Purple Top	16	1,660	561	00	16	1,460	557	40	16	1,560	559	20
15	Good Luck	17	450	574	10	16	600	543	20	16	1,525	558	45
16	Jumbo	13	70	434	30	15	1,680	528	00	14	875	481	15
	Average	18	1,398	623	18	17	1,631	593	51	18	514	608	34

MANGELS.

The seed was sown May 19 in plots 1/66 acre in size. The drills were two feet apart and the plants thinned to about one foot in the rows. The land received the same treatment as to cultivating and manuring as that used for turnips. Yet the total yield per acre of mangels was less than one-half of that of turnips.

MANGELS.—Test of Varieties.

No.	Variety.	Yield per Acre. 1st Plot.				Yield per Acre. 2nd Plot.				Average Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.
1	Danish Sludstrup	10	1,910	365	10	9	1,800	330	00	10	855	347	[illegible]
2	Yellow Leviathan	9	480	308	00	9	1,460	323	20	9	940	315	40
3	Giant Yellow Globe	8	1,420	290	20	9	1,600	326	40	9	510	308	30
4	Perfection Mammoth Long Red	9	1,600	326	40	7	1,640	260	40	8	1,620	293	40
5	Mammoth Long Red	8	1,560	292	40	8	1,090	284	50	8	1,325	288	45
6	Giant Half Sugar White	9	20	300	20	8	40	267	20	8	1,030	283	50
7	Prize Mammoth Long Red	8	1,090	284	50	8	900	281	40	8	995	283	15
8	Giant Yellow Intermediate	8	1,160	286	00	8	630	277	10	8	895	281	35
9	Gate Post	8	370	272	50	8	1,290	288	10	8	830	280	30
10	Golden Tankard	8	240	270	40	8	1,230	287	10	8	735	278	55
11	Selected Yellow Globe	7	1,840	264	00	8	1,030	283	50	8	435	273	55
	Average	8	1,790	296	30	8	1,514	291	54	8	1,652	294	12

INVERMERE.

CARROTS.

The seed was sown on June 19 on the flat. Plots one-thirty-fifth of an acre with drills 2 feet apart, plants 4 inches apart in the rows. The land was twice hand hoed, and twice cultivated with a one-horse cultivator.

CARROTS.—Test of Varieties.

No.	Variety.	Yield per acre, 1st plot.				Yield per acre, 2nd plot.				Average yield, per acre.			
		Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.	Ton.	Lb.	Bush.	Lb.
1	White Belgian	6	360	206	00	7	810	246	50	6	1585	226	25
2	Ontario Champion	6	1440	224	00	6	500	208	20	6	970	216	10
3	Giant White Vosges	4	1870	164	30	7	1650	260	50	6	760	212	40
4	Mammoth White Intermediate	5	1690	194	50	6	460	207	40	6	75	201	15
5	Improved Short White	5	1520	192	00	6	390	206	30	5	1955	199	15
		5	1776	196	16	6	1562	226	2	6	669	211	9

SUGAR BEETS.

The seed was sown May 19 on the flat. Plots one-sixty-sixth of an acre each. Drills 2 feet apart and plants 10 inches to 1 foot apart in the rows.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per acre, 1st plot.				Yield per acre, 2nd plot.				Average yield, per acre.			
		Ton	Lb.	Bush	Lb	Ton.	Lb.	Bush.	Lb	Ton.	Lb.	Bush.	Lb.
1	French Very Rich	9	1800	330	00	7	650	244	10	8	1225	287	5
2	Klein Wanzleben	9	1270	321	10	7	850	247	30	8	1060	284	20
3	Vilmorin Improved B	7	1490	258	10	7	1460	257	40	7	1475	257	55
4	Vilmorin Improved A	7	1050	250	50	7	650	244	10	7	850	247	30
		8	1403	290	3	7	903	248	23	8	155	269	13

LEGUMINOUS FORAGE PLANTS AND GRASSES.

Duplicate plots of one-eightieth of an acre each were sown in June with:—

Kentucky Blue Grass.
Red Top.
Meadow Fescue.
Orchard Grass.
Timothy.
Western Rye Grass.
Red Clover.
Alsike Clover.
Sainfoin.
Alfalfa.

All of the varieties made a good start and have withstood the winter conditions well.

INVERMERE.

EXPERIMENTAL STATION, FORT VERMILION, ALTA.

REPORT OF MANAGER, R. JONES.

INDIAN CORN.

Six varieties of Indian corn were tested this year. They were planted on May 4 in hills 2½ by 3 feet apart on land which was in summer-fallow 1913. The plots which were one-thirtieth acre in size were cultivated a number of times to encourage the growth and to prevent the evaporation of moisture from the soil during the very dry spell in May and part of June. The plots were cut on September 10 with the following results:—

Indian Corn.—Test of Varieties.

No.	Variety.	Average Height.	Condition When Cut.	Yield per Acre.	
		Inches.		Ton.	Lb.
1	King Philip	66	In silk	20	1,280
2	Early Canada	60	Early milk	19	1,370
3	Angel of Midnight	68	"	19	880
4	Longfellow	62	"	18	1,000
5	Salzer's North Dakota	58	In silk	17	320
6	Compton's Early	60	"	16	1,400
	Average			18	1,375

FIELD ROOTS.

All field roots were grown on land which had been in potatoes in 1910, wheat in 1911, oats 1912, and summer-fallow in 1913. All plots were one-sixtieth of an acre.

TURNIPS.

Four varieties of turnips were sown in drills 24 inches apart on May 11. The plants were thinned to one foot apart in the drills. The land was thoroughly cultivated a number of times with the hand hoe. On account of the drought in the early summer, the yield was somewhat below the average. The yield was also influenced by a severe attack of insects in May which necessitated re-seeding of several plots. The affected varieties were re-sown on May 30.

The plots were harvested on September 12.

Turnips.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Perfection	20	80	668	00
3	Hartley's Bronze Top	19	1,600	660	00
3	Good Luck	17	1,400	590	00
4	Magnum Bonum	15	1,760	529	20
	Average	18	710	611	50

MANGELS.

Four varieties were sown on May 9, in drills 24 inches apart. The plants were thinned to one foot apart in the rows. The plots were harvested on September 18.

MANGELS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Giant Yellow Intermediate	36	520	1,208	40
2	Giant Yellow Globe	32	840	1,080	40
3	Gate Post	20	1,800	696	40
4	Prize Mammoth Long Red	20	240	670	40
	Average	27	850	914	10

CARROTS.

Four varieties were tested. They were sown on May 9 in drills 20 inches apart and the plants thinned to about 5 inches apart in the rows. Harvesting took place on September 15.

CARROTS —Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Mammoth White Belgian	36	960	1,216	00
2	White Belgian	31	280	1,038	00
3	Ontario Champion	26	920	882	00
4	Half-long Chantenay	24	1,720	828	40
	Average	29	1,470	991	10

SUGAR BEETS.

Two varieties were sown, on May 9, in drills 24 inches apart. The plants were thinned to about one foot apart in the rows. Harvesting took place on September 17.

SUGAR BEETS—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton.	Lb.	Bush.	Lb.
1	Vilmorin Improved	22	1,160	752	40
2	Klein Wanzleben	21	120	702	00
	Average	21	1,640	727	20

FORT VERMILION.

LEGUMINOUS FORAGE PLANTS AND GRASSES.

Alfalfa.—Four varieties, viz.: Montana, Sand Luzerne, Grimm's and Ontario Variegated, were sown on May 2. The plots were cut on July 16 and yielded as follows:—

No.	Variety.	Yield per Acre.	
		Ton.	Lb.
1	Ontario Variegated	1	1,050
2	Sand Luzerne	1	600
3	Montana	1	400
4	Grimm's	1	300
	Average	1	588

The above plots were cut a second time in the latter part of September and the cutting left on the ground to act as a mulch for the protection of the roots.

Two other plots of alfalfa were sown on June 8. On account of the ground being very dry at the time of sowing the germination was somewhat slow. After the rains in the early part of July, however, the growth was progressing rapidly. The plots were clipped in September and the clippings left on the ground for winter protection.

Sainfoin.—One plot of Spanish sainfoin, sown in 1913, yielded, when cut on July 16, at a rate of 1,800 pounds to the acre.

Red Clover.—A small plot of Red Clover was sown on June 5. It entered the winter in very good condition.

Grasses.—Plots of Timothy, Western Rye Grass and Awnless Brome Grass were sown in the spring of 1913 with a nurse crop of oats. They were cut on July 15 and yielded as follows:—

No.	Variety.	Yield per Acre.	
		Tons.	Lb.
1	Awnless Brome Grass	2	1,560
2	Western Rye Grass	2	1,000
3	Timothy	1	1,500

A plot, one-sixtieth of an acre in size, was sown on May 16 to Canary grass. It was cut on August 11 and yielded at a rate of 2 tons 1,400 pounds to the acre.

Red Top, Kentucky Blue Grass, Meadow Fescue, Western Rye Grass, Awnless Brome Grass and Orchard Grass were sown, on June 8, in plots one-eighth of an acre in size. They were sown with a nurse crop of oats which was cut as green feed on August 12. At the end of the growing season, the stand of all varieties was rather unsatisfactory.

FORT VERMILION.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE POULTRY DIVISION

For the Year Ending March 31, 1915.

PREPARED BY

The Dominion Poultry Husbandman, Ottawa.	F. C. Elford.
Superintendent—	
Experimental Station, Charlottetown, P.E.I.	J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S.	W. W. Baird, B.S.A.
Experimental Station, Kentville, N.S.	W. S. Blair.
Experimental Station, Fredericton, N.B.	W. W. Hubbard.
Experimental Station, Cap Rouge, Que.	G. A. Langelier.
Experimental Farm, Brandon, Man.	W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask.	K. Macbeen, B.S.A., Asst.
Experimental Station, Lethbridge, Alta.	W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta.	G. H. Hutton, B.S.A.
Experimental Farm, Agassiz, B.C.	P. H. Moore, B.S.A.
Experimental Station, Invermere, B.C.	G. E. Parham.

REPORT FROM THE POULTRY DIVISION.

The Director,
Dominion Experimental Farm
Ottawa, Ont.

Sir,—I have the honour to transmit herewith the twenty-eighth annual report of the Poultry Division. Included in this is a short account of conditions that prevailed throughout the greater part of the year; the experimental work conducted by the Poultry Division at the Central Experimental Farm and the eleven Branch Farms and Experimental Stations at which there are kept poultry. These latter reports are prepared by the following Superintendents: J. A. Clark, B.S.A., Experimental Station, Charlottetown, P.E.I.; W. W. Baird, B.S.A., Experimental Farm, Nappan, N.S.; W. S. Blair, Experimental Station, Kentville, N.S.; W. W. Hubbard, Experimental Station, Fredericton, N.B.; G. A. Langelier, Experimental Station, Cap Rouge, Que.; W. C. McKillican, B.S.A., Experimental Farm, Brandon, Man.; K. Macbean, B.S.A., Assistant to the Superintendent, Experimental Farm, Indian Head, Sask.; W. H. Fairfield, M.S., Experimental Station, Lethbridge, Alta.; G. H. Hutton, B.S.A., Experimental Station, Lacombe, Alberta; P. H. Moore, B.S.A., Experimental Farm, Agassiz, B.C., and G. E. Parham, Experimental Station, Invermere, B.C.

There is also an account of a lecturing trip taken by Mr. Fortier to the north shore of the Gulf of St. Lawrence.

During the year eight circulars of the Exhibition Series have been prepared and published, while several bulletins are in process of preparation.

The applications for lectures and judging have increased to such an extent that many of the requests for lectures and most of those for judging have had to be refused.

Poultry work has not been started at any new Farms this year, as it was deemed wiser to get the eleven that were already started fairly well established before others were included. The stock at each of those Farms already keeping poultry has been materially increased and the aim is to have on each at least 300 laying hens of which 200 will be pullets and 100 breeding hens.

The stock at the Central Farm has more than doubled in the year and includes good specimens of turkeys, geese and ducks as well as ordinary fowl.

I have the honour to be, sir,
Your obedient servant,

F. C. ELFORD,
Dominion Poultry Husbandman.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

REPORT OF THE DOMINION POULTRY HUSBANDMAN, F. C. ELFORD.

CONDITIONS PREVAILING THIS YEAR.

The past year was remarkable in that because of the unsettled state of trade, prices for produce were very uncertain and generally low, while the cost of feed that producers had to buy was high. In many cases producers complained that the cost of production was more than the produce would bring when sold, and it is quite possible this fact was responsible for the sale last fall of many pullets that should have been retained for winter egg production.

The season of high priced feed and low priced product will not be an unmixed evil if it will induce poultrymen to introduce business principles into their operations and to study how to produce at less cost and how to market to better advantage to themselves as well as with more satisfaction to the consumers.

Low prices help consumption and indirectly assist the producer. Last fall and winter when dressed poultry was low, many families who had hardly tasted poultry for years, had it on their tables. The same is the case with fresh eggs, and at least some of these families, having acquired a taste for it, will continue to eat poultry produce even when the prices are higher.

GREATER PRODUCTION IS NEEDED IN CANADA.

Canada is not raising enough poultry and eggs to feed herself. At one time she was an exporting country, now it is necessary to import both eggs and poultry to supply the local demand. In the year 1901, she exported 11,363,064 dozen of eggs, and imported 951,745 dozen. In the year 1914, 11,274,108 dozen of eggs were imported and 124,002 dozen were exported, and $200,000 worth of poultry dead and alive was imported in excess of the value exported.

It might be interesting to know just where these imported eggs came from, and also where the few eggs that were exported went to. Of the imports, 10,795,682 dozen came from the United States, 406,562 dozen from China, 60,407 dozen from Hong Kong, 10,320 dozen from New Zealand, 790 dozen from Great Britain, and 275 dozen from Japan. Of the few that were exported, the United States got 62,273 dozen, Newfoundland 44,789 dozen, St. Pierre and Miquelon 13,708 dozen, Bermuda 2,562 dozen and British Oceana 580 dozen.

The fact that Canada is yearly going behind in supply, however, is not because her poultry population is decreasing, for there were in 1911 more hens per capita than ever. The truth is, Canadians are eating more eggs every year, and if we continue to improve the quality of eggs that go on to the consumer's table, it is quite likely that the average consumption will increase still further.

It looks as if Canada must increase her egg production or still go hungry for these products, and the probabilities are that next year will see fewer eggs produced in Canada than has been the case for several years past. The high price of feed last fall and the comparatively low price of market poultry meant that a number of laying hens were killed before winter set in.

Fig. 1. Wrappers for New Laid Eggs.

Fig. 2. Wrappers for Hatching Eggs.

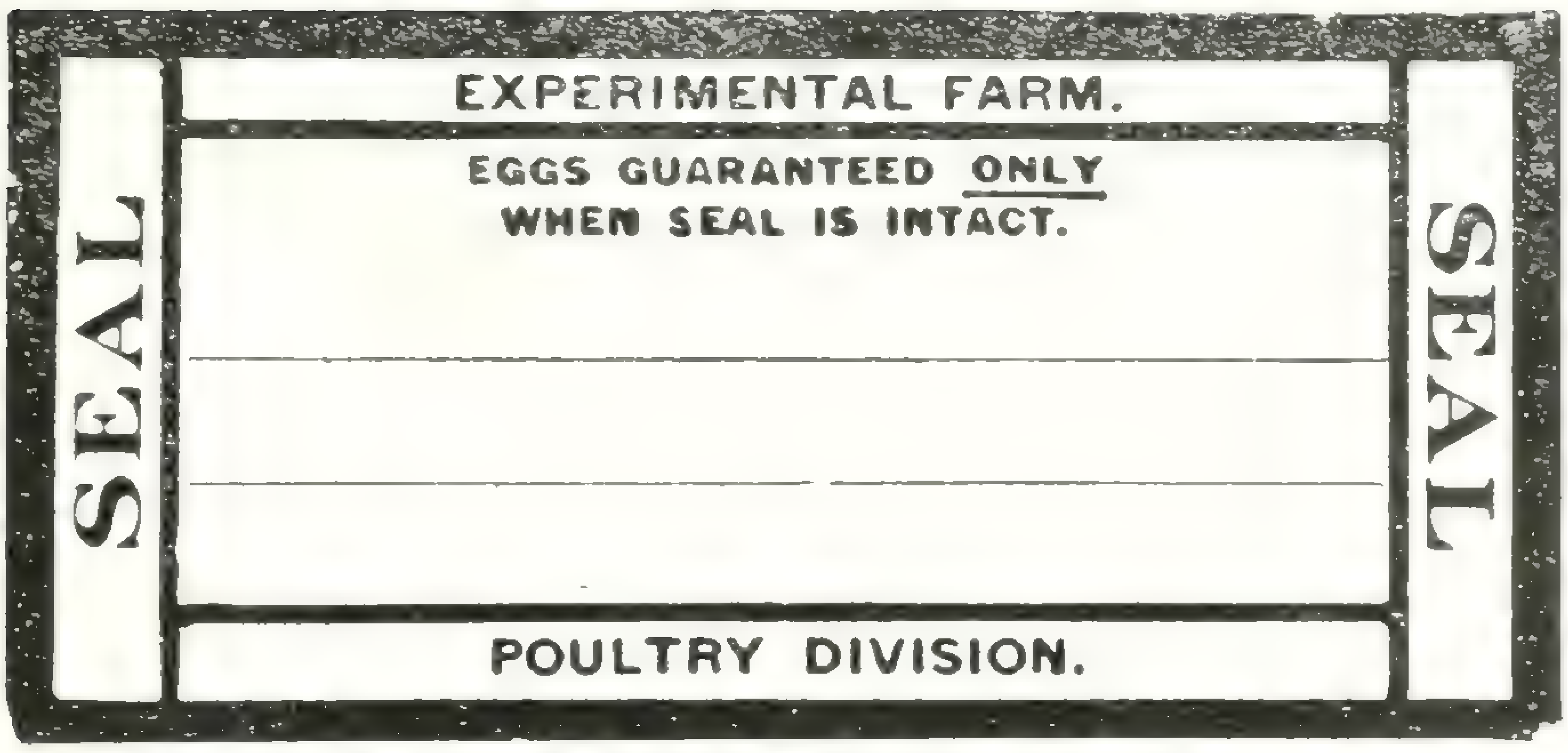


Fig. 3. Seal for New Laid Egg Cartons.

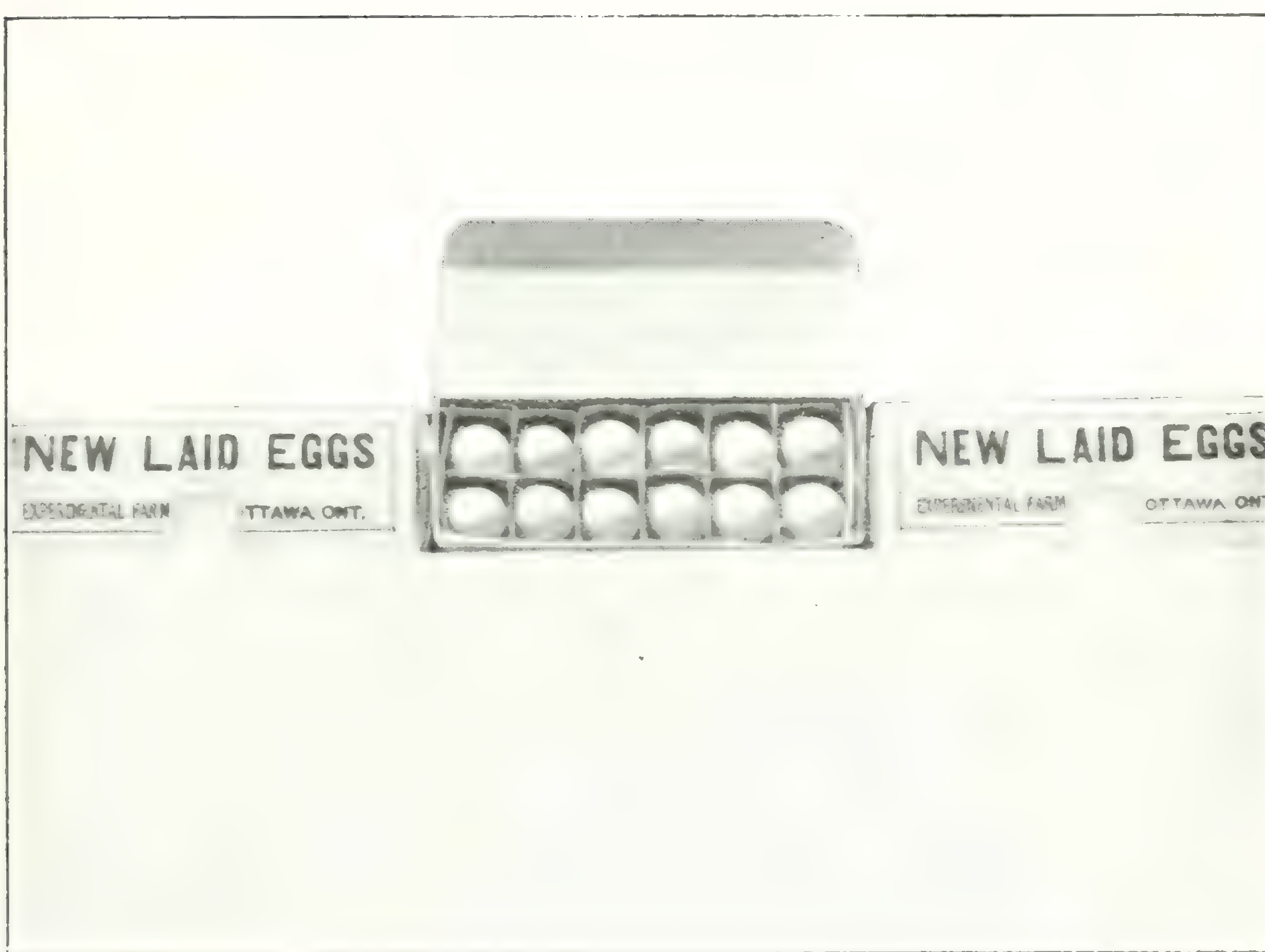
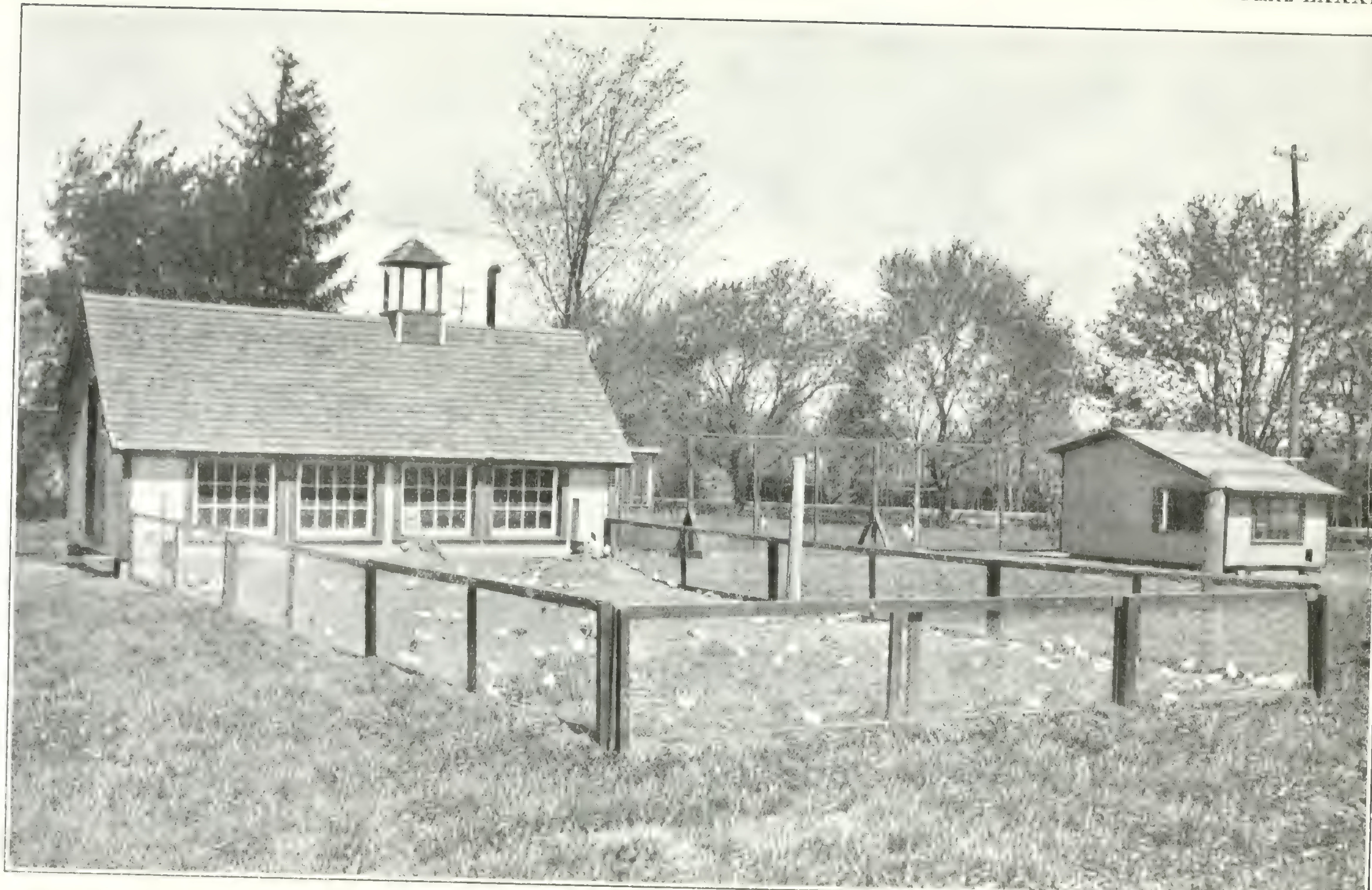


Fig. 4. Cartons holding one dozen new laid eggs.



A Room Brooder.

An illustration of a room brooder house in which a Candee coal burning stove is placed. This house is large enough to accommodate from five hundred to eight hundred chicks and a simple arrangement of yards such as shown makes a most convenient place for brooding chicks until they can have free range. The stove is very easily regulated and the amount of fuel required small.

Experimental Breeding House.

An experimental house arranged so that visitors can see the birds either in the pens or the yards. The house is 12 feet deep and divided into pens six feet wide. The hens get into the individual yards by passing under the raised walk. There are larger yards at the back towards the north, to which the pens of birds have access in turn. The windows are arranged so that frames of glass or cotton may be inserted and the partitions are made of removable cotton screens which allows two or more pens to be thrown into one; the floor is cement.

THE DEMAND FROM ABROAD.

The home conditions look as if greater production is not only warranted, but urgently needed, and no account has been taken of the demand for poultry products, and especially eggs, that will come from abroad. Just now, when we are being asked to produce, to help feed the Empire, is surely a good time for Canada to get back into the exporting class. It may be that we shall not be able to export much this year, but we ought at least to lay the foundation for greater production that will permit of some export at least. Great Britain consumes about 12 million eggs every day; a little over a third of these are produced within her own border, but the rest of them, over 200,000,000 dozen a year, have to be imported from other countries; and if one will take just a look at the countries that have been supplying these eggs in the past, it will be seen that her source of supply this year and possibly for several years to come, will be partially cut off, if she does not get some new sources of supply.

During the year 1913, Russia was the biggest contributor, sending, in round figures, 114½ million dozen; then came Denmark with 42½ million, Egypt 11 million, the Netherlands 10 million, Austria-Hungary 9 million, Italy 8½ million, France 7 million, Germany 5 million, Sweden 3½ million, other countries, including Canada and the United States, 4½ million.

From this it will be seen that the bulk of Great Britain's egg supply has come from countries now actively engaged in war or affected thereby, so that, in all probability, many of these sources will be cut off entirely and a number more considerably curtailed.

With such a state of affairs, is it right that we in Canada, instead of helping to produce poultry and eggs to feed the Empire, should be really eating what others are producing, and are thereby a hindrance instead of a help in this time of national need?

HOW WE CAN INCREASE PRODUCTION.

Good Breeding Stock.—In the effort to increase production, one of the first points to lay stress upon is a warning not to breed from poor stock. A few breeders might think, because greater production is asked for, it would be advisable for them to set eggs from anything and everything, but probably no greater mistake could be made, for it is to be remembered that we are building for the future, and even more care than ever should be taken that the breeding stock should be as good as possible and especially should it have health and vigour. Do not use breeding stock that has ever been anaemic, or that lacks constitution. Eggs set from such birds never prove very fertile and the chicks cost more to raise than they are likely to bring when matured.

Keep the Cost of Production Down.—Care must be taken also that the cost of production is not too high, and the first step to lessen the cost is taken when we eliminate everything from the breeding stock but that which has the very best constitution. Adopt system in the poultry work. Give it into the care of some one person, rather than allow any person (which very often means no person) to be responsible for the plant. It is a good thing for both the plant and the manager to allow one of the children even to take over the management. Let the boy or girl have an interest in the plant. Assist them to put it on a business basis, so that they can keep accurate accounts and know how much revenue is obtained from the plant each month and year.

System in feeding, system in marketing, along with clean sanitary conditions go a long way to cut down the expense of production.

Early Pullets Necessary.—Every year eggs are scarce and consequently high in price during the late fall and early winter, and the only way to have eggs to sell at this time of the year is to get ready in plenty of time. Early spring is the time to prepare for eggs the following November. See that the pullets are hatched early, because it is only the early pullet that will give the early egg. If possible, mate with the healthy hens in the spring, a good vigorous cockerel that comes from a laying strain. Feed the young chicks well throughout their growing period and have the pullets matured early and put into winter quarters before they are ready to lay, so that they can go right ahead without any interruption.

Market When Ready.—Though there is a good deal of waste in the system of production, there is even more in the methods of marketing. Study the egg market as well as the wheat market and sell eggs how and where they are worth the most. Of course, the only time to market eggs is when they are absolutely new laid, and the national loss that occurs from the marketing of eggs when they are not new laid, but in some cases when they are absolutely stale or even rotten, amounts yearly to an enormous sum, and because of this national waste, which the producer can largely overcome, he has to take a less price for his produce. Market eggs as direct to the consumer as is practicable and market in such a condition that the producer can guarantee the product, and so that he will not be ashamed to have his name appear on every package.

In the marketing of dressed poultry, the aim should be to distribute the produce over as many of the 12 months as possible. Our system in Canada, of throwing everything both old and young on to the market within a few months in the fall, has done more to bring down prices of poultry meat than anything else. If this year we would endeavour to market as many of the early cockerels as possible in the spring when they can be sold as broilers, it would lessen the glut which invariably takes place in the fall. Sell the old hens after the breeding season rather than along with the chickens in the fall. The relative profits for spring marketed produce and for that marketed in the fall show a marked contrast. As an illustration take the prices for the young ducks which we marketed last year, an account of the sale of which was given in the 1913-14. Report, page 966. These green ducks were marketed when 10½ weeks of age and brought at 20 cents a pound within a few cents of a dollar each. Similar ducks, however, when marketed in the fall or the usual time for selling them, brought the same price per head, but the difference in the cost of production meant the difference between a good margin of profit and a loss. The green ducks cost for the amount of feed seven cents per pound of gain, which meant that the selling price gave practically 200 per cent profit over the cost of food, whereas the selling price for the older ducks in the fall barely covered the cost of feed. The Toronto quotations for ducklings last spring were from 30 to 50 cents per pound live weight, while the quotations last fall for the matured ducks were 9 to 11 cents.

The same is true of the chickens; broilers were bringing 30 to 50 cents per pound live weight in the spring when roasters, or the same birds if sold in the fall, were bringing 10 to 13 cents, and as for hens, the fall prices quoted in Toronto were from 6 to 8 cents, whereas in the spring they were quoted at 14 to 20 cents.

This system of holding practically all poultry meat until fall is disastrous and must be remedied if the producer wants to get the most out of what he has to sell, and incidentally the early marketing materially cuts down the cost of production.

All producers are unable to avail themselves of these higher prices because of distance from market, cost of transportation and comparatively small quantities of produce to sell; nor can it be expected that they will be able to do so under present conditions, but there are others who might do so, and if they would it would help the general market a little at least while those not so favourably situated might co-operate and through co-operation have sufficient to make it worth while to ship.

Ottawa.

In this connection, however, it should be considered almost criminal to sell poultry for eating purposes unless it is finished. Thin poultry is given by the dealers as one of the reasons why prices were so low last fall and the conditions were even worse than usual because of the high price of feed. It costs less to put on the last few ounces or pounds, or what might be called the finishing touches, than it does to put on a similar weight at any other time in the growth of the bird. This increases the price of the bird materially, so that the producer gains in both ways, *i.e.*, lessens the cost of production and increases the price of the article.

Village and Town Poultry.—There seems no reason why the keeping of poultry should not be more popular in the towns and villages, and even in some sections of the cities. The objection frequently advanced can be traced to two sources,—the insanitary conditions in which a few poultrymen keep their poultry plant, and the presence of nervous or over-sensitive neighbours.

First take the latter reason: It is astonishing how many people can keep a dog and pay little attention to its continual barking. How seldom they hear the tooting of the automobile or the racket which the early city deliveries make, or even the shrill whistle of the steam engine. Any, or all of these may make noise enough to waken the whole town, and very little complaint is ever heard, but let a well-meaning rooster attempt a morning crow, no matter how musical it may be, and the police department is notified at once. Surely at this time, when so much is being said about the high cost of living, ordinary common sense might be used in cases of this kind.

On the other hand, there is no reason why poultry plants in the limits of the town or city should become a nuisance if ordinary sanitary precautions are taken. It might be a good plan if all towns or cities would appoint a capable inspector who would see that all poultry plants were kept in a sanitary condition. There are many city families that could not only provide themselves with new laid eggs and table poultry, but by keeping a small flock of laying hens could make use of feed that goes into the garbage can, and might in some instances almost keep the family table provided with groceries.

It is the summer conditions of the city poultry plant to which most objections are raised and to overcome this, many city and town families follow the practice of buying on the market or elsewhere well matured pullets in October and November, feeding them heavily for eggs throughout the winter and selling or eating the birds in the spring. This method is to be recommended as it provides eggs when eggs are high in price, turns table scraps into new laid eggs and leaves the back yard for the summer garden with a quantity of good fertilizer for growing vegetables, etc. In most cases the birds can be sold in the spring for what will replace them with pullets in the fall. See experiment in this report, page 1111.

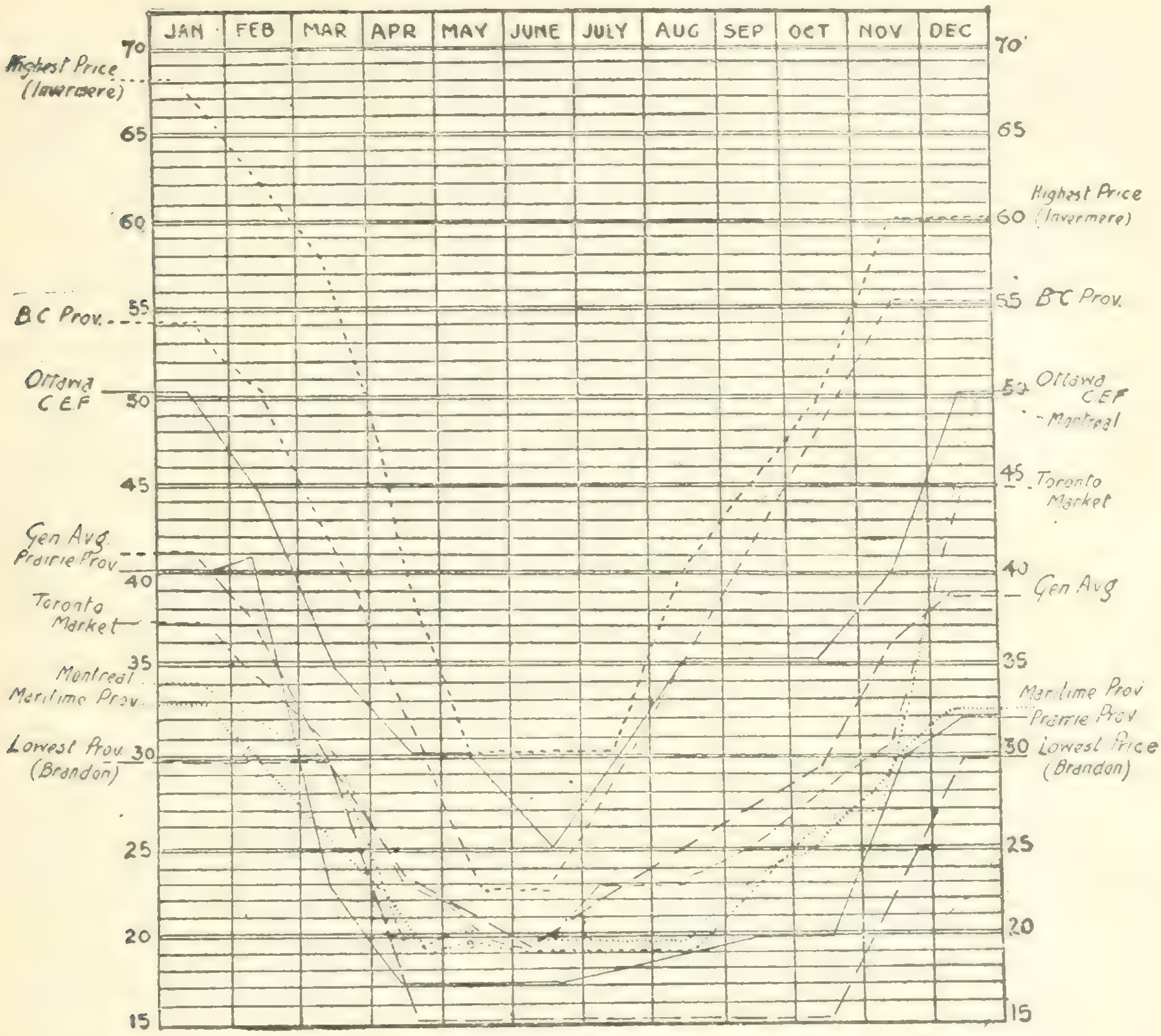
PRICES RECEIVED FOR EGGS AT THE VARIOUS FARMS OF THE EXPERIMENTAL FARMS SYSTEM.

The prices given in the table below, though they are not always the actual local prices, will indicate the relative value of new laid eggs for the various months of the year at the several Farms that sold eggs throughout the year 1914.

All eggs marketed from this system are selected, wrapped in printed tissue paper and packed in one dozen egg cartons, sealed and, if to be shipped, enclosed in corrugated carriers that hold six or twelve one-dozen egg cartons.

Farms.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Avg. per Farm.
Agassiz, B.C.	40	40	25	25	25	25	27½	35	40	45	50	50	35½
Invermere, B.C	68	62	58	40	30	30	30	40	45	50	60	60	48
Lacombe, Alta.	40	35	18	17½	17½	17½	20	22½	25	25	30	35	25
Indian Head, Sask	50	50	20	20	20	20	20	20	20	20	30	30	27
Brandon, Man	30	30	30	15	15	15	15	15	15	15	30	30	21
Frèdericton, N.B.	40	35	35	25	25	25	25	25	25	28	35	35	30
Nappan, N.S.	31	31	27	25	25	25	25	25	25	25	30	30	25
Kentville, N.S.	30	28	20	14	18	18	18	18	22	22	25	35	22
Charlottetown, P.E.I	32	30	25	19	20	20	20	22	23	25	30	34	25
Average per month	40	38	29	22	22	22	22	25	27	28	35½	37½	29
Average for B.C.	54	51	41½	32½	22½	22½	29	37½	42½	47½	55	55	41
Average Prairie Provinces	40	41	23	17	17	17	18	19	20	20	30	32	25
Average Maritime Provinces	33	31	27	21	22	22	22	22½	24	25	30	32½	25½
C.E.F., Ottawa	50	45	35	30	30	25	30	35	35	35	40	50	36
Average for all Farms	41	38½	29	23	20½	20	23	21½	27½	29	36	39	29½
Toronto prices	37	33	30	20	21	19	23	23	25	28	31	45	28
Montreal prices	34	32	30	19	20	19½	19	19	22	26½	27	50	26½

Chart No. 1.—The range of prices given by provinces or sections, of new laid eggs at Experimental Farms, also the average range of prices paid for eggs at Toronto and Montreal.



NOTE.—Of individual farms, Invermere, B.C., has the highest average price for the year and British Columbia has the highest provincial average. Brandon has the lowest average. The lowest range of the highest average price is the same as the highest range of the lowest average price—30 cents. The highest price occurs in January and the lowest in June.

EGG WRAPPERS AND SEALS.

The use of wrappers for fresh eggs adds considerably to the appearance of the package when opened and also to the safety in shipping of both new laid eggs and eggs for hatching. Illustrations of the wrappers used at the Experimental Farms are given herewith. These wrappers are made of light tissue paper such as is used on oranges and are in size 8 inches by 8 inches.

The seals, of which an illustration is also given, are for the purpose of locking or sealing the carton so that the contents cannot be interfered with until opened for consumption.

OTTAWA.

IS THE SHIPPING OF HATCHING EGGS HARMFUL?

Last spring, breeding eggs were shipped to a number of the branch Farms and in several cases the fertility of the eggs after being tested at the branch Farms was considerably lower than the fertility found in similar eggs set at the home farm.

It would be well, however, to note that in the case of the shipped eggs they would be from two to five days older than those set at Ottawa, though this should not make the difference shown in the table below.

Fertility and Hatchability of Eggs at Central Experimental Farm compared with results obtained at Branch Farms with eggs from same pens at approximate date of shipping.

Date Shipped from Ottawa.	Similar eggs set at Ottawa.	Station Shipped to.	Result after Shipping.		Results at Ottawa.	
			Per cent fertile.	Per cent fertile hatched.	Per cent fertile.	Per cent fertile hatched.
April 20	April 20	Lethbridge, Alta	51·8	7·4	84·4	51·3
May 19	May 19	Brandon, Man	95·5	44·0	73·6	28·4
	" 22				81·1	79·5
May 27	" 27	Nappan, N.S	96·5	00·0	73·6	28·4
	" 30				81·1	79·5
July 2	July 2	Lacombe, Alta	25·9	28·5	92·5	74·3
" 2	" 2	Agassiz, B.C.	28·6	37·5	92·5	74·3
General Average			60·2	23·5	82·7	59·4

Note.—As far as possible the eggs were similar.

In two cases the fertility at destination was higher than at Ottawa, though the general average gives a decrease of twenty per cent in fertility and twenty-three per cent in hatchability in the shipped eggs.

The non-hatch at Nappan, N.S., must have been partially due to local causes.

It looks as though the less handling and travelling hatching eggs receive the better.

MARKETING LATE PULLETS IN FALL *versus* HOLDING UNTIL SPRING.

At the beginning of last winter, having on hand a lot of thrifty late hatched pullets, the result of incubation experiments, it was decided to carry some over the winter to see if it would pay better than to market them at the time. There were seventy White Leghorns that had been hatched about the middle of July and had been pushed as rapidly as possible, the cockerels having been marketed as soon as ready.

These seventy pullets were divided into two sections; twenty of the best were placed in a back yard to be run as a city flock, the other fifty were put into a small pen of a glass and cotton front house.

On January 1, twenty of these pullets, averaging two and a half pounds each, were placed in their back yard poultry house where they were fed largely on table scraps. For the months of January, February, March and April, the only food purchased was 150 pounds cracked corn $2.70, 100 pounds shorts $1.40, one bag of potatoes 75 cents, a total for feed of $4.85. During that time these pullets produced a total of 957 eggs as follows: 92 in January, which sold at fifty cents, the price at which eggs were sold here, $3.83; 192 in February at forty cents, $6.40; 308 in March at thirty-five cents, $8.98; 365 in April at thirty cents, $9.12, a total revenue of $28.33, or in

other words these twenty pullets turned $4.85 worth of feed, plus table scraps, that would otherwise have been wasted, into $28.33 worth of eggs, a gain over cost of feed of $23.48.

At the same time fifty others averaging two and one-quarter pounds were placed in two ten by ten pens and a record kept of all the feed consumed and the eggs produced, during the same period. During the first part of the period they were fed grain consisting of equal parts cracked corn and wheat in the litter morning and evening, with crushed oats in hoppers constantly before them. Later the grain was changed to equal parts corn, wheat and oats, and a dry mash consisting of two parts wheat bran, two parts middlings, two parts cornmeal, one part gluten feed, and one part meat scrap, was used instead of the crushed oats. The pullets also had oyster shell, grit and charcoal constantly before them, and milk, green bone and roots were regularly supplied.

During the four months, January, February, March and April, they consumed 781 pounds grain, 205 pounds mash, 105 pounds crushed oats which at two cents per pound amounted to $21.82; 15 pounds charcoal, 10 pounds grit, 35 pounds shell at one cent per pound, 60 cents; 72 pounds green bone at three cents per pound, $2.16; 1,200 pounds of milk at twenty-five cents per 100, $3; 360 pounds roots at $5 per ton, .90; or a total of $28.48 for feed for the four months. During the same period they laid 100 eggs in January which were sold at fifty cents, $4.16, 248 in February at forty cents, $8.26, 641 in March at thirty-five cents, $18.69 and 772 in April at thirty cents, $19.30; a total of $50.41, or in other words a profit over cost of feed of $21.93.

It will be noticed that these birds were kept in fairly crowded quarters and the prices allowed for feed were in every instance high, higher than most poultry keepers would have to pay, also the amount of green bone, milk and roots were estimated and in every instance the estimate was always placed high. The eggs were rather small but were not too small to be readily saleable; they weighed twenty-three ounces to the dozen. There were six birds lost during this period, but the remaining forty-four weighed seven pounds more at the beginning of May than the fifty did at the beginning of January. It should also be noted that the pullets were just coming into full laying at the end of the period, and the next four months would see a greatly increased production, so that whether the pullets were marketed at the end of the test, at twenty cents per pound, which was the price that could have been obtained, or whether, as would be the most profitable course, they were kept over for several months and then marketed, the advantage of keeping till spring in either case would be substantial. The following statement of the two lots shows clearly the profit made on each lot.

EXPENDITURE AND RETURNS of twenty late-hatched pullets for four months, kept under city conditions.

Dr.			
20 pullets, 2½ pounds, 50 pounds at 12 cents		$ 6 00	
150 pounds corn	$ 2 70		
100 pounds shorts	1 40		
1 bag potatoes	75		
		4 85	
			$10 85
Cr.			
92 eggs, Jan. at 50 cents per dozen	$ 3 83		
192 " Feb. at 40 cents per dozen	6 40		
308 " Mar. at 35 cents per dozen	8 98		
365 " Apr. at 30 cents per dozen	9 12		
		$28 33	
19 hens, 3 pounds, 57 pounds at 20 cents		11 40	
			$39 73
Net profit over cost of feed			$28 88

OTTAWA.

EXPENDITURE AND RETURNS of fifty late-hatched pullets for four months where all food was purchased.

DR.			
To 50 pullets, 112 pounds at 12 cents..		$13 44	
781 pounds grain, 205 mash, 105 crushed oats at 2 cents per pound..	$21 82		
15 pounds charcoal, 10 pounds grit, 35 pounds shell, at 1 cent per pound..	60		
72 pounds green bone at 3 cents per pound	2 16		
1,200 milk at 25 cents per 100..	3 00		
360 pounds roots at $5 per ton..	90		
		28 48	
			$41 92
CR.			
By 100 eggs in Jan. at 50 cents per dozen.. ..	$ 4 16		
248 " Feb. at 40 cents per dozen. ..	8 26		
641 " Mar. at 35 cents per dozen ..	18 69		
772 " Apr. at 30 cents per dozen. ..	19 30		
		$50 41	
44 hens, 120½ pounds at 20 cents per pound..		24 10	
			$74 51
Net profit over cost of feed..			$32 59

NOTES.—In both cases it paid to keep the pullets over till spring and as noted above, the laying was reaching a high record at the close of the contest period.

It is also well to note that table scraps for four months from a family of three were worth in new laid eggs $6.59, being the difference in the cost of feed required for twenty birds in the two cases.

These late pullets would never grow to a good size nor would it be wise to use them for breeding.

Part of the extra revenue obtained by keeping the birds until spring is obtained from the higher price for meat available at that time.

WHEY AS A SUBSTITUTE FOR SKIM-MILK IN CRATE FEEDING.

Because of so many inquiries reaching us in reference to the possibility of using whey instead of skim-milk in mixing the mash for crate-feeding poultry, a small experiment was conducted in December, 1914, the results of which are given here.

Method of Feeding.—Thirty-six birds used in the experiment were assorted as nearly as possible as to size, vigour and breed.

They were starved for 24 hours before the experiment commenced and given water with a mild dose of Epsom salts.

They were fed sparingly the first day and the quantity of feed was gradually increased at each meal till they were on full feed at the end of the third day.

The feed was mixed thin enough to pour slowly into troughs and two feeds were given daily as far apart as possible allowing for daylight. Windows were darkened except when the birds were eating.

Grit was supplied once a week and a little green food every other day at mid-day.

All birds were weighed at the end of the starvation period and weekly during the experiment.

At the end of the experiment the birds were starved 36 hours and weighed before killing.

They were again weighed dressed (with head and feet), and also when drawn, ready for the oven.

OTTAWA.

Weekly gains, feed consumed, pounds of grain and cost of one pound gain on skim-milk and whey.

Crate Number.	Whey or skim-milk.	Weight of 12 birds at start of experiment.	Total gain in three weeks.	Weight at end of three weeks.	Feed consumed in three weeks.			Total feed consumed.	Whey or milk consumed.	Pounds of feed for one pound of grain.	Pounds of milk or whey for one pound of gain.	Total cost of one pound of gain.
					1st	2nd	3rd					
		Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Cents.
*1	Skim-milk............	49·0	27·5	76·5	34	25·0	21	80 0	124·0	2·9	4·4	6·8
2	Whey.......... ...	57·5	13·5	71·0	31	20·5	16	67·5	102 0	5·0	7·4	12
3	Whey and beef scrap..	59·5	10·5	70·0	30	21·5	21	72·5	109·0	6 9	10·0	16

* 11 birds only; one died seventh day, weight 3½ pounds.
Note.—Feed cost 2 cents per pound. Skim-milk and whey reckoned at 25 cents per 100 pounds.

EDIBLE AND NON-EDIBLE PARTS.

The relative weights of giblets, head and feet, feathers and offal compared with the dressed weight of the carcass, and the figures given are the average for each crate of twelve birds, as shown above.

Average Weight Dressed and Drawn.

Crate.	Dressed carcass.	Giblets.	Head and feet.	Feathers.	Offal.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
No. 1..........................	66·3	7 6	15·1	4·0	7·0
" 2..........................	67·4	7·6	13·0	5·4	6 5
" 3..........................	66·9	7·5	12·8	5·8	7·0

Note.—No. 1 moulted considerably and at plucking were heavily pin feathered. The ration would probably have something to do with this as both the whey, and whey and beef scrap crates feathered about the same.

CAPONS versus COCKERELS FOR PROFIT.

The marketing of capons has been receiving considerable attention for some time, though there seems to be a difference of opinion as to whether on an ordinary market it pays better to caponize or market as cockerels.

To get some data upon this subject 12 cockerels and 24 capons were selected in November, 1914, when the 12 cockerels and 12 of the capons were put into crates and milk fed for three weeks. The other 12 capons were fed in a pen until spring. In March they were put into a crate and fed in a similar manner to those fed in December.

The purpose of the experiment was first: To ascertain the relative advantage of feeding and marketing cockerels and capons at the time cockerels are usually sold and when farmers would find it almost necessary to get rid of the birds whether

cockerels or capons because of lack of room. Second: To find the relative profits in marketing capons in the fall at 5 or 6 months of age or in the spring at 9 or 10 months.

Up to the time the 12 cockerels and 12 capons were put into the crates the cost had been practically the same. The capons were a little older than the cockerels and as will be noticed by the table, weighed more. The cockerels had had large yards to run in; the capons had been yarded in smaller pens.

FEED CONSUMED, TOTAL COST OF FOOD; COST OF ONE POUND OF GAIN AND NET GAIN OF COCKERELS AND CAPONS.

Birds.	Weight at start.	Total gain.	Weight 3 weeks.	Feed consumed.	Milk consumed.	Pounds of mash for 1 lb. gain.	Pounds milk 1 lb. gain.	Total cost 1 lb. gain.	Total cost.	Market value.	Market value less cost of crate feeding.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	cts.	cts.	$ cts.	$ cts.
Cockerels	49	27·5	76·5	80	124	2·6	4·2	6·9	1·89	15 30	13 41
Fall capons	58	18·0	76·0	76	118	4·1	6·3	10 0	1·80	19 00	17 20
Spring capons	76	8·0	84·0	87	125	11·0	15·5	25·0	*7·98 2·00	29 40	19 42

* Cost of feeding from fall to spring.

NOTES.—The fall cockerels sold for 20 cents per pound and the fall capons for 25 cents, while the capons in the spring brought 35 cents per pound; but the capons sold in the spring had cost $7.98 for feed to carry them over the winter.

The capons grew in weight better than the cockerels before going into the crates, but did not do as well during the three weeks crate feeding and the cost in the crates was more per pound.

The higher sum received for the fall capons was just equivalent to what the five cents higher price amounted to.

In this case the capons paid better because the flesh was worth five cents per pound more.

The advisability of keeping capons until spring again depends upon the greater price received for them.

INCREASE OF FERTILITY AFTER INTRODUCTION OF THE MALE.

In last year's report, page 962, table 5, the daily increase in fertility after the introduction of the male was shown, and for the sake of comparison with table No. 9, showing the decrease of fertility after the removal of the male, the table is again given here.

DAILY INCREASE in Fertility after Introduction of Male.

Pen.	Breed.	Date mated.	Per cent Fertility, First to Twenty-first day.																					
			1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.	17th.	18th.	19th.	20th.	21st.	In Pen.
16	Barred Plymouth Rocks.	Mar. 13...	Nil	Nil	8·3	20·0	25·0	8·3	36·3	40·0	30·7	37·4	100·0	61·5	68·2	41·6	30·0	60·0	50·0	60·0	50·0	66·6	75·0	31 hens.
22	"	" 13...	Nil	Nil	20·0	12·5	25·0	100·0	66·6	75·0	72·7	83·3	55·5	91·6	90·9	72·7	75·0	100·0	76·1	78·5	87·5	84·6	100·0	23 pullets.
	Average.....	....	Nil	Nil	14·1	16·2	25·0	54·1	51·4	57·5	51·7	60·3	77·7	76·5	79·5	52·1	52·5	80·0	63·0	69·9	68·7	75·6	87·5	

DECREASE OF FERTILITY AFTER REMOVAL OF MALE.

The increase of fertility upon the introduction of the male has been noted, and it is also important to know how long it takes after the removal of the male for fertility to cease. It is well to know this, especially if the eggs at the close of the hatching season are to be used for consumption or preserved for winter use.

The following table and chart are of interest as they show that the germ exists in fertilized eggs for a far longer period than is generally supposed to be the case.

To carry out this investigation two pens were utilized.

Pen 16 contained 49 Barred Plymouth Rock pullets, pen 17, 39 two and three year old Leghorn hens.

The fertility of both pens had been very satisfactory all through the hatching season, the males being strong vigorous birds of one year and two years respectively.

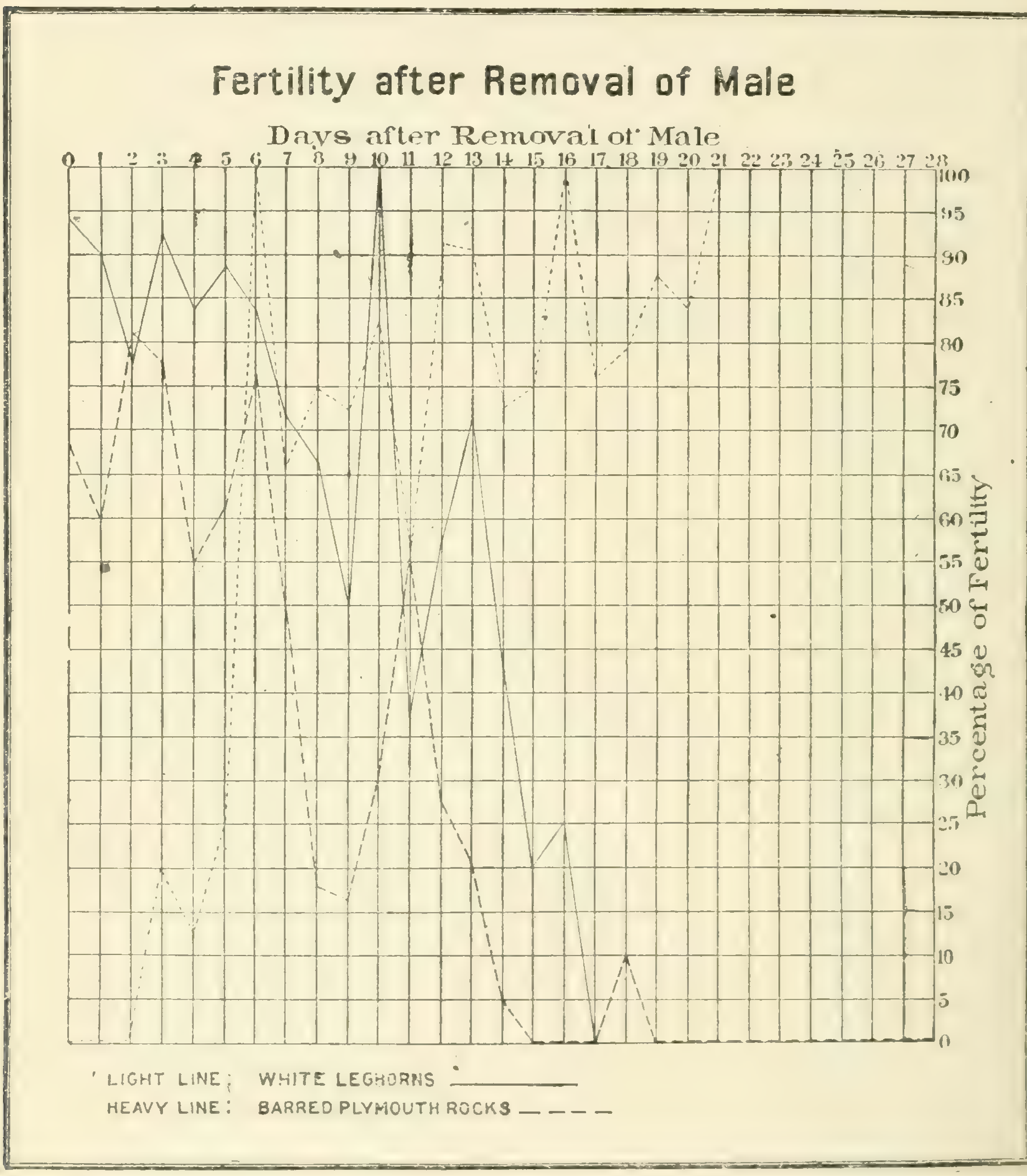
The eggs from both pens were taken from the nests daily, marked as to date, and placed in a Candee Incubator.

The experiment was prolonged nine days after the germ had apparently ceased to exist so that it could reasonably be accepted that such was the case.

Decline in Fertility day by day after the removal of the Male from Pen.

Days Removed.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
White Leghorns	94·28	90·00	77·78	92·31	83·33	88·89	83·33	71·43	66·67	50·00	100·00	37·50	51·14	71·43	42·86	20·00	25·00	0·00	0·00
Barred Plymouth Rocks	68·57	60·00	81·25	77·78	55·00	61·54	76·67	50·00	18·18	16·67	30·00	55·56	27·78	21·05	5·00	0·00	0·00	0·00	10·00

It will be seen from the following chart that the decline was somewhat erratic in both pens and not steadily weaker as might have been supposed but on the tenth day after the removal of the male the Leghorn pen showed the remarkable fertility of 100 per cent though 66·6 of these fertile eggs were "blood rings" and only 33·3 strong germs.



NOTE.—The fine dotted line starting at 0 on the 2nd day and ending at 100 on 21st day denotes the increase in fertility in a pen of Barred Plymouth Rock pullets after the introduction of the male. There was no fertility after the eighteenth day, though the eggs until the twenty-sixth day were set and tested.

This experiment goes to show that there are traces of fertility even to the eighteenth day, and eggs intended for storing should not be taken until the male bird has been removed for at least two weeks.

The fertility was traceable to the eighteenth day, but in such small proportion as to be of little detriment.

OTTAWA.

ADMINISTRATION BUILDING AT BRANCH FARMS.

An administration building for the poultry work has been built at several of the branch Farms and Stations, photograph and plan of which is given here. The arrangement of the various rooms is convenient and allows for an incubator room large enough for seven hundred or eight hundred egg space in small machines, or twelve hundred eggs in a mammoth machine, an egg room which is also used for testing, and a coal room in the basement. The ground floor provides for an office and record room and a room for mixing feed; into this room come spouts from the grain bins above. The attic contains a bed room and a store room for grain. Feed is elevated into this room by means of a rope and pulley which delivers the bags through the gable door.

This arrangement has proven quite satisfactory at the branch Farms and is recommended for small and medium sized plants requiring similar accommodation.

A NEW DISEASE IN DUCKLINGS.

During the summer of 1914 there were numerous complaints and inquiries received at this Division, also published in the poultry press, about a disease that had made its appearance in ducklings. These complaints were not confined to any one locality but came from widely separated districts. One newly established commercial plant that expected to go into duck raising extensively lost ducklings in large numbers that they procured for foundation stock. These were purchased in the United States from some of the largest and most successful duck growers, some as day-old ducklings and some at from three to six weeks old. The age at which they were shipped did not seem to make any difference, as apparently they were affected in the same manner.

After visiting the above mentioned plant, which may be referred to as "A," and noting the condition of the sick ducklings, a few were brought to this Division for observation. It was then decided to get 100 day-old ducklings from "B", a large American breeder, to study the disease. Later a shipment of 46 ducks weighing 90 pounds, half of a lot which "A" had received from "C" (the American breeder who had supplied most of their stock), were also received. "B" shipped to this Division one hundred and three ducklings; two were dead on arrival on a Friday evening, the others appeared to be in good condition. On Monday morning when they were fed they appeared to be in normal condition except for two or three that looked a little sleepy; half an hour after feeding 18 were stretched out dead. Out of the 101 ducks received 44 were raised. From 46 received from "A" 37 were raised. The other half of the shipment which "A" retained were practically all lost.

A few of the ducklings which were hatched from eggs from Experimental Farm stock were also affected but they were isolated cases and did not die in groups as the imported ducklings died.

The trouble was not confined entirely to the ducklings, as growing ducks about six weeks of age were sometimes affected, though in the more mature ducks the symptoms were more pronounced and were often noticeable for some time before death. There was a discharge from the eyes and sometimes from the nostrils, and there appeared to be an affection of the brain as the head would be thrown back until it touched the shoulders, the duckling often staggering backwards until it would fall over. In one case a duckling kept up a continual thrashing with its head for over two days until it finally became exhausted and died. In another case the head was thrown back and downwards, then brought forward and upwards, until the neck formed a complete loop. In some cases the ducklings seemed to recover although it was noticeable that under excitement some of the symptoms were liable to recur, and at the "A" plant some of the ducklings would be taken with these spasms while swimming and the result was that they would drown.

OTTAWA.

With a view to determine the reason for the losses the matter was taken up with Dr. Higgins of the Biological Laboratory who detailed Dr. Wickware to study the problem presented. Dr. Wickware saw the affection at the "A" plant and at the plant of this Division. His examination revealed a parasite in the blood of all seriously affected cases. This parasite gradually disappeared as recovery took place and it is assumed to have some connection with the appearance of the affection in question. Further studies are necessary before this point can be fully determined. It may be advisable to point out that the staff of the Biological Laboratory consider it absolutely necessary to have the sanitary conditions under which ducks are maintained at the very highest standard obtainable.

They also consider that the breeding stock should be virile and that the methods of raising should preclude the possibility of infection gaining entrance from outside sources, or of limiting it should such an infection unfortunately gain access to any portion of the plant. They make this suggestion pointing out the fact that many wild birds are known to harbour blood parasites without presenting evidence of disease and that the same birds, if placed under artificial conditions, may readily succumb to such parasitic infections which under normal conditions would cause little or no appreciable inconvenience to the birds in question.

We present this explanation in order that the reader of this report may in some measure understand the difficulties encountered in dealing with losses from unaccountable causes. Where losses are experienced, material should be forwarded with as little delay as possible to the Biological Laboratory for examination and there should accompany it a full detailed report concerning the difficulties. It is only by the reporting of such losses that knowledge can be secured which will lead to their future prevention and elimination.

At first it was suspected that the shipping of the ducklings was largely responsible for the trouble especially as both "B" and "C" claimed that they had no trouble whatever. However, a visit to plant "C" revealed the fact that there had been trouble and a great deal of it, for it was learned there that as many as 600 ducklings would die in a single day. It was also stated by men on this plant that the trouble had been so bad at plant "B" that incubation had to be stopped entirely on account of it.

At the Canadian plant "A," a flock of about 400 breeding ducks was kept over for 1915 season's breeding but on the disease again appearing in the early hatches this spring the proprietor marketed practically the entire flock.

In Canada the production of green ducks is just in its infancy and unless something is done immediately to combat this apparently new but dread disease, as far as Canada is concerned the industry will receive such a setback as will take it years to recover from.

SHORT ACCOUNT OF TRIP MADE TO THE COUNTY OF CHICOUTIMI AND SAGUENAY, QUE., FROM JULY 1 TO AUGUST 5, 1914.

By Victor Fortier, Assistant.

During the first half of July, together with Mr. Joseph Girard, M.P., I visited the principal parishes of the eastern part of the County above mentioned on the north shore of the Gulf of St. Lawrence from Portneuf to Natashquan, 400 miles below Tadousac. It was the first time that the inhabitants of this part of the province of Quebec had been visited by an employee of the Federal Department with a view to speaking to them on agricultural matters. The meetings were well attended, the average number of people present being about 150. They all appeared well pleased

Poultry Administration Building, colony brooder house and permanent laying house at Cap Rouge, P.Q.

FIG. 17. First cotton front poultry house erected in the Lower St. Lawrence, below the Saguenay River, the property of Mr. Xavier Maltais, Dalbeau, P.Q. This gives satisfaction, even in this extremely cold district.

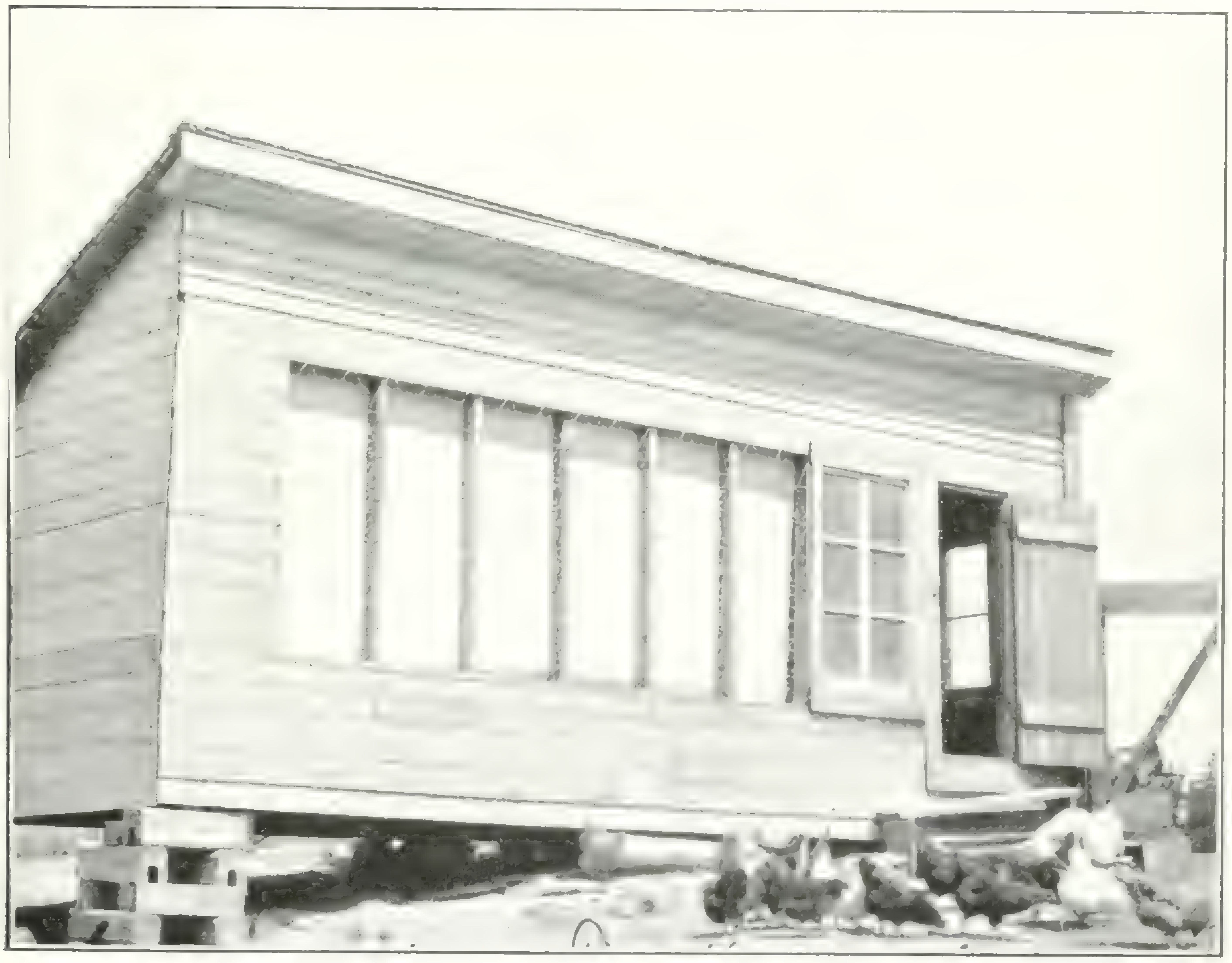


FIG. 18. Poultry House belonging to Mr. S. Larouche, Taillon, County of Lake St. John. If the cotton had been brought nearer the roof, there would have been a better circulation of air in the top part of the house.

FIG. 15. Poultry house which does not give satisfaction, at Esquimault Point, 500 miles below Quebec. Though double-boarded and tight, there is nothing in this building to counteract the deleterious effects of lack of light and ventilation.

Poultry house which gives satisfaction at Esquimault Point, 500 miles below Quebec. The lack of light in main building is made up by the larger windows and large space for cotton on front of scratching shed.

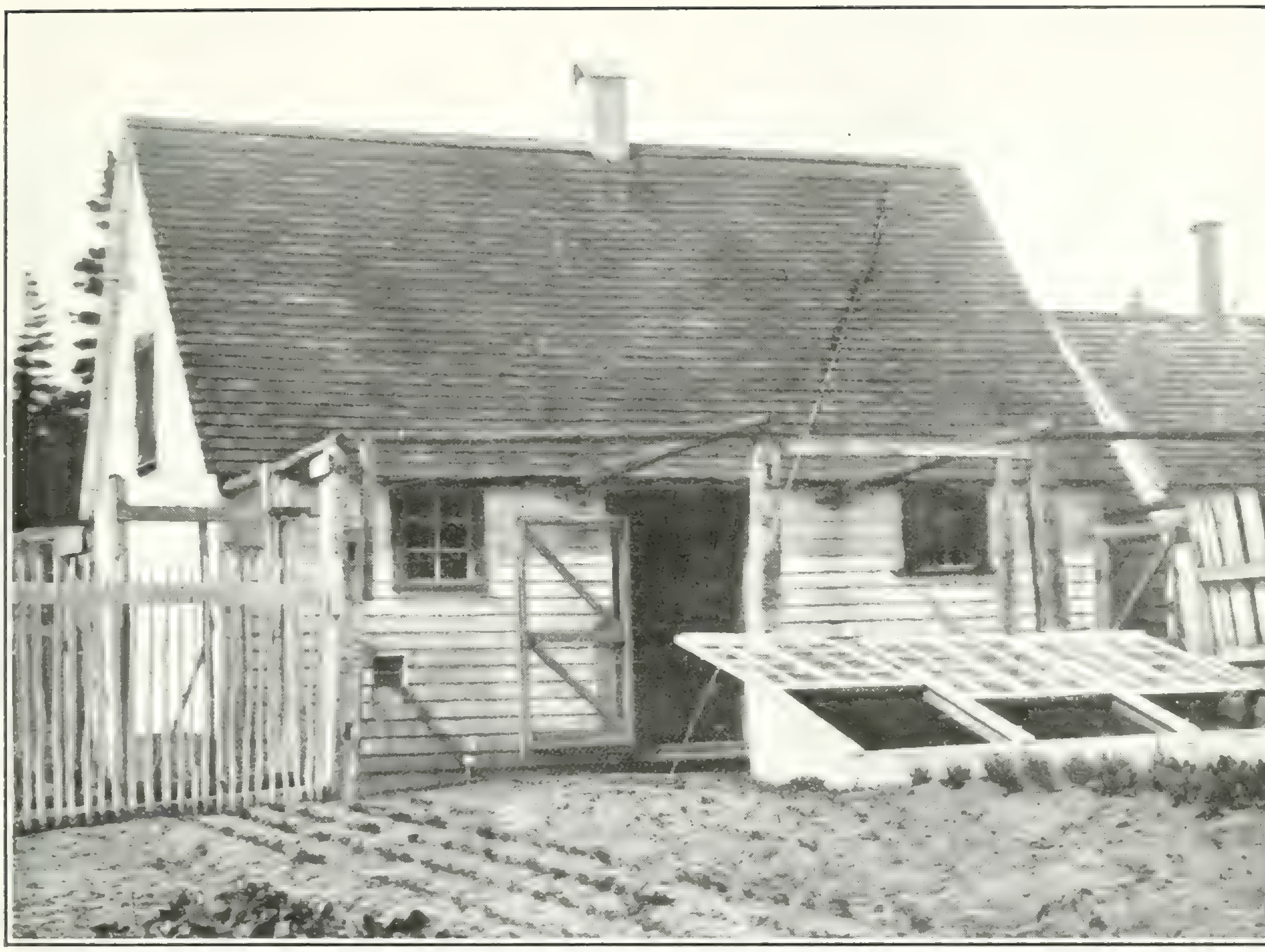


FIG. 16. Poultry house at Natasquan, 620 miles below Quebec. This is damp and ill-lighted, though costing three times more than a modern shed, roof cotton-front house.

Main Street, Seven Islands, 300 miles below Quebec. Note absence of vegetation of any kind.

with the information given them on poultry raising and on agriculture in general. The latter subject was dealt with by Mr. Girard, whose experience and knowledge in general farming were greatly appreciated.

Scientific poultry raising and also the modern methods of farming are very little known in this part of the country. The methods followed are primitive and much educational work is needed. Although eggs and poultry are, with fish, the main food used by numerous families on the north shore of the Gulf of St. Lawrence, the quality of the poultry throughout this section is very poor. The early hatching of chickens is very little understood and winter egg production is practically nil, although that is the very time during which eggs would be most acceptable to these people who then find themselves almost completely isolated and deprived of all communication and means of transport by boat or by railway.

Entering the Bay of Seven Islands a magnificent view is presented. On the left one sees a large whale fishery, on the north the wharves of Clark City, where large vessels can be accommodated, on the right the village of Seven Islands situated on a large sand hill. The bay itself is about five square miles in area and furnishes an excellent natural port which could shelter a large fleet. The village of Seven Islands is made up entirely of French Canadians, whom I found hospitable, intelligent and obliging. There are about 300 houses in the village. A third of them are occupied by Indians of the Montagnais tribe. These are gentle, timid and at first distrustful, but as soon as one becomes acquainted with them the children follow one all over the village and the parents themselves seemed to regret our departure.

Not a single tree was to be seen in the street. However the view over the bay, which is remarkable in its nature, was superb. At Seven Islands is the residence of Monseigneur Blanche. There is also a very pretty church and a fine one. A doctor is located there and there are several general stores. Fishing and hunting are excellent in this locality.

A regular weekly service of boats is maintained with Quebec.

In going to Pointe-aux-Esquimaux, we passed the island of Anticosti, where we had occasion to visit the splendid and immense Meunier establishments, most of which stand on Ellice Bay. The woodpulp industry seems to be in a flourishing condition. Stores, warehouses, bakeries, post office, fire hall, etc., are all well constructed, and are kept in good condition. The settlement comprises about thirty families.

Baie Sainte Claire.—A little village of about sixty families, situated nine miles north of Ellice Bay, has excellent roads. There are many wild animals of all kinds in the vicinity.

Our call at Baie Ste. Claire was much appreciated by the inhabitants of the island. Mr. Joseph Girard, M.P., in the name of the Government, presented to Mr. Albert Malouin, lighthouse keeper of the west point, and Deputy Governor of the island, an Imperial Service medal for long and faithful service (41 years).

Pointe aux Esquimaux.—This village consists of a hundred and eighty-five families, mainly French Acadians. No farm work is carried on here. Potatoes grow fairly well, and the people keep a few fowls. Besides these, the principal industry is the cod and salmon fishery.

Natashquan.—This village contains forty-five fishermen's families. The soil is sterile, and poultry are the only living things the inhabitants are able to rear.

Mingan.—This settlement has a population of sixty Indian families, and only three French Canadian families. There is hardly any poultry raising, and no agriculture. We had a meeting there at which 125 people were present. The speeches were interpreted by the Roman Catholic missionary of the place.

Riviere Saint Jean.—Sixty French families. In winter the fishermen go to the timber yards. The young people might occupy themselves advantageously with poultry raising. Little agriculture is carried on here, but the soil is fairly fertile, and about twenty good milch cows are kept, but there are no dairies.

Oats ripen well, and potatoes produce ten to fifteen fold. The people deserve encouragement, and they need practical advice in agriculture and aviculture, for they have little knowledge of how to care for animals and poultry in winter.

Riviere au Tonnerre.—A village of forty-five families grouped round a little bay, whose deep waters offer a splendid harborage for small ships. We were surprised to learn that oats, barley, hay, tobacco, potatoes, vegetables, etc., thrive better than elsewhere. The soil is sandy. Nearly every family possessed some domestic animals, and there were about eighty head of cattle in the parish.

From July 16 to August 5, Mr. A. Gingras, of St. Cesaire, Que., accompanied me, and we visited together the district west of Chicoutimi and Saguenay, from Portneuf to Mistassini. In the principal centres of this county we held two meetings each day, one at ten o'clock in the morning and the other at about eight o'clock at night. Generally, the audiences were good, averaging 125 people, with a minimum attendance of 40, and a maximum of 225. At the latter end of the trip, work in the fields prevented a great number of farmers from attending the morning meetings. In harvest-time, it is not practicable to hold agricultural meetings in the day-time, but those held in the evenings are well attended, in spite of the fatigue resulting from field work. In the course of our journey, we saw excellent harvests of hay, grain, and vegetables in some localities, while in neighbouring districts, where the soil appeared equally good, the crops were poor. There, as in many other parts of the country, we discovered in the case of some farmers, a little negligence, indifference, lack of knowledge, and much routine work, some not paying sufficient attention to the drainage of their farms, others to their system of farming, their selection of animals, the care of their agricultural implements, their choice of seeds, etc.

Aviculture, in the last few years, has made appreciable progress, this progress being attributable principally to the meetings that have been held in the country, and to the excellent results obtained at the poultry station which was formerly at Chicoutimi. At the present time, several farmers obtain a considerable revenue from poultry raising. Among them might be mentioned Mr. M. A. Gobeil of Chicoutimi, Adelard Fortin of Chambord, George Laberge of St. Prime, Madame Joseph Girard of Mistassini, S. Laroche of Taillon, etc.

We were told several times that ensilage corn could not mature in the vicinity of Lac St. Jean, and we were therefore surprised to see, on the farm of Mr. Edgar Bouchard, of St. Jerome, (Lac St. Jean) a fine field of this corn. This gentleman told us that for several years he has successfully cultivated ensilage corn, which has been of great use to him in the wintering of his live stock. This year, Mr. Bouchard has decided to construct a good silo, whose fine proportions and good arrangement we were able to see.

In conformity with instructions received, photographs were taken in the different centres visited. They are attached to this short report, and will give a fairly good idea of the places and people that live there.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

POULTRY.

During the year a substantial poultry fence was erected around the poultry yards which were laid off just south of the sheep pens on the knoll facing the Prince Edward Island railway. The land was tile-drained and the houses arranged conveniently so that material could be hauled to or from them and visitors could get to them in groups during excursions. Two experimental colony houses were added to the equipment and necessary rearing houses and coops were made.

BREEDING STOCK.

The breeding stock in the spring of 1914 consisted of one pen of White Leghorns with one male and nineteen females, one pen of Barred Plymouth Rocks with one male and fourteen females and two pens of Barred Plymouth Rocks with one male and sixteen females each.

The season of 1914 seemed to be unfavourable for incubation. Many poultrymen reported a very large percentage of chicks dead in the shell. The percentage of chicks dying in the shell was quite high for all eggs set early in April in the incubators. As soon as the weather improved so that the breeding stock could run outside more there was a marked decrease. The percentage of chicks dying in the shell under the hens was only about 12 per cent for the season and was much less than under artificial incubation. Five hundred and sixty-three chickens were hatched during the season. Of these 524 were put in the brooder or given to hens and 340 chickens were raised to maturity.

METHOD OF FEEDING CHICKS.

When the chicks were hatched they were given warmth and rest, not being fed for the first few days. After being placed in the brooder house the chicks were given a little coarse sand and left until they were two to three days old and appeared hungry. They were then given bread crumbs moistened in milk. Any food left by the chicks was removed. They were then fed about every two and one-half hours during the day until they were about a fortnight old, as follows:—

First feed.—Dry bread crumbs slightly moistened with milk.

Second feed.—Finely cracked mixed grain or commercial chick feed.

Third feed.—Rolled oats.

Fourth feed.—Dry bread crumbs moistened with milk.

Fifth feed.—Finely cracked mixed grains.

In addition they were given a little green grass and sprouted oats.

Water and grit were always available.

After the first fortnight the chicks were given coarser foods. Infertile eggs were boiled hard and mixed with the mashed food. Rolled oats and dry mash was placed where the chickens could get it at any time. The bread was discontinued; sweet milk was fed.

As soon as the weather was fit, the chicks were given runs outside with a hen to look after them or a brooder was placed in a rearing house and protection given them from cats and crows.

CRATE FATTENING *versus* COOP FATTENING.

An experiment was started on December 5, with 48 Barred Plymouth Rock cockerels to see if cockerels could be fattened as well in rearing coops as in specially prepared crates. Twenty-four birds weighing 122¾ pounds were placed in two crates and twenty-four other birds weighing 122¾ pounds put in two rearing coops. Each crate had three divisions so that there were four birds in each division. The coops were not divided; twelve birds being placed in each. They were given a fattening mash made up as follows: Two parts buckwheat, one part oats, one part barley, ground very fine (hulls sifted out) and mixed with milk.

The gains in both cases were equal but those in the crates were cleaner and had a better appearance than those in the coops.

ARRANGEMENT OF WINTER HOUSING.

In the autumn the best stock was selected out and housed as follows:—

House.	Breed.	Age.	No. of Leg Bands.
No. 1	B. P. Rock	Pullets	101-125.
" 2	" "	"	126-155.
" 3	" "	Hens	Old and several new.
" 4	" "	Hens and Pullets	Old and new to 167.
" 5	W. Leghorn	Pullets	201-225.
" 6	" "	Hens and Pullets	226-250.

They were fed the following dry hopper mash: Two parts bran, one part shorts, one part corn meal.

The grain fed was mixed as follows: Two parts wheat, one part oats, one part buckwheat, one part barley to all except No 1 which got one part cracked corn and one part wheat instead of two parts wheat.

It was found that the pullets in House No. 1 began to lay earlier, but later on the pullets in House No. 2 laid more eggs.

A small feed of grain was fed about 8 a.m. and a larger feed was given in the afternoon. As many roots were fed as they would eat. Oyster shell and coarse grit were always where they could get them. A small quantity of beef scrap or blood meal was fed as required.

Each house had its supply box and the feed for the week was weighed in each Saturday.

The birds were trap-nested and the eggs for incubation or that were sold for hatching were from the best hens from a utility standpoint.

After we had selected out, for this Station, what we considered was the best stock, surplus shipments of good stock were sent to the Kentville Experimental Station and to the Fredericton Experimental Station. Cockerels of good quality were sold locally at $2 each for White Leghorn cockerels. Eggs for hatching from selected stock were sold at $1 for a setting of 15 eggs.

The houses with the peak roof and straw loft were found to keep the litter dry for a longer period than the houses with the shed roof.

Records of temperature in the different houses were kept during the winter and as soon as sufficient data are available to secure reliable averages it will be published.

CHARLOTTETOWN.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

POULTRY.

Very satisfactory progress can be reported from this Farm toward the establishment of a new poultry plant, which was only started during the season of 1913-14. Six colony houses of various types were built during October and November of that year, with a view of making a careful study of these different types as to their particular suitability for this district. It was rather late in the winter when these houses were finished and made ready for the birds, hence very little information regarding them could be gained, but, notwithstanding this fact, the results obtained, and which are recorded in this report, were most encouraging.

The flock at present is made up as follows: Wyandottes, forty-nine hens, twenty-five pullets, two cockerels and three cock birds; Barred Rocks, forty-five hens, forty-five pullets and four cockerels; Single Comb Leghorns, twenty hens, twenty-six pullets, one cockerel and one cock bird.

These were placed in different houses and a careful record of the fertility, hatchability, and livability of the chicks produced from the different breeds kept, which is just a continuation of the work started last season and is recorded here under experimental work.

NEW BUILDINGS.

The following new buildings were erected this year: One permanent house of the shed roof type, 16 feet by 32 feet, accommodating one hundred birds.

One brooder house of the shed roof type 12 feet by 14 feet, in which was installed a Candee brooder stove, accommodating from three to four hundred young chicks.

An incubator and feed house, one and a half stories, 18 feet by 26 feet, with cement basement for incubators.

CONSTRUCTION.

The permanent house is built on a cement wall six inches by twelve inches underneath which is a trench 18 inches by 18 inches filled with broken stone. This not only affords a solid foundation, but likewise acts as a drain. The floor was laid with three inches of cement, protected from the damp soil by six inches of broken stone and gravel, thus insuring a dry floor, which is very essential in a poultry house. Small wooden plugs were inserted in the unhardened cement to allow the sill to be spiked down tightly to the wall. All material used for the frame work was two by four inch scantling, except for rafters. In the case of the corner posts and plates two pieces two by four inches nailed together were used. Rafters were two by six inch scantling placed at two feet centres. For boarding in nine inches planed boards with two-inch battens were used. The roof was single boarded and covered with paroid roofing.

From the accompanying plate it will be seen that the front of this house, which is seven and a half feet high in the front and five and a half feet high in the back, is about two-thirds cotton and one-third glass; the cotton screens are hinged so that they can be kept open on fine days. The four windows have twelve lights each 10 by 12 inches.

As the building is divided into two pens it will be noted that there are two glass windows to each, one large cotton screen in the centre and two smaller ones on each side. This seems to make an ideal front, permitting plenty of fresh air and light.

The sheathing is single ply seven-eighth inch board except the portion of the north wall around the roost, that is up the back, on both ends and over top, width of roost only. Movable nests are placed underneath drop-boards, these being about two and a half feet from the floor. Small cages are made in both pens for the male birds, just at the ends of the roosts near the centre of the building. While this type of house has been used only one winter it has nevertheless given very satisfactory results.

The brooder house which is much the same type of house was built on two six by six inch runners to allow moving from place to place. All frame work was two by four inches. The building is six and a half feet in the front and five and a half feet at the back. It is sheathed on the outside and inside of the studding with well seasoned three-eighth inch matched lumber. The front is nearly all glass as will be noted from the plate. Only a strip along the bottom of the windows is sheathed. All windows are hinged at the bottom to allow opening in at the top, thus preventing a direct draught on the young chicks.

As before stated this building is heated by a Candee brooder stove, which, so far, has given fairly good results, though there is need of slightly better ventilation in the house.

The incubator and feed house is built on a side hill, so that the ground level starts at the top of the cement wall at the east end and slopes off to the bottom of it at the west end, thus making a portion of the basement beneath the surface.

The cement wall upon which the building rests is seven feet high and 12 inches thick made of No. 1 Portland cement one part and five parts good gravel. Underneath this at the west end and part of the way back on both sides, is a trench three feet deep and two feet wide filled with broken stone to protect the wall from frost, for at this end the bottom of the wall is on the ground level.

The floor is also of cement one part to six of good gravel, on top of six inches of broken stone to prevent dampness. All material used was good spruce and hemlock scantling two by four inches for studding and plates, two by six inches for rafters and sills and two by ten inches for joists. The building is fourteen feet in the post with a fifteen foot rafter. The walls were lathed and plastered. The house has also a double floor with building paper between. The roof was single boarded, then heavy paper and shingles laid four and one-quarter inches to the weather. The sides and ends were single boarded and covered with heavy building paper, then clapboarded. Windows were placed in each room to admit plenty of light.

The basement is divided into two rooms, one being used for incubators and the other for heating water and dressing poultry. The first floor is divided into three rooms, one is used for the keeping of records, the second as a room for the poultryman and the largest room for a feed room, the top storey is for the storage of feed, etc.

This plant is now permanently located in a three acre triangular field just east of the main barns. It is being fenced with turned cedar posts set one rod apart and electric-weld poultry wire. This makes a most attractive fence, when neatly put up. Inside of this again a number of smaller runs were built in front of each pen, for the breeding flocks during part of the year. The Page poultry wire was used on these in order to test out the durability of the two wires. The poultry plant is really the centre of attraction, being surrounded on all sides by the main driveway of the Farm.

The prices of eggs in this locality have been slightly better on the whole during the past season than they were for the previous year. In the case of farmers having regular customers the average for 1913-14 was 29·9 cents per dozen, while for 1914-15 they received 30·8 cents per dozen, but taking the country store eggs and those sections some distances from the market the average price would not be over 20 cents per dozen.

Dressed poultry has been in good demand and would average about 22 cents for crate fed birds. Country stock, not crate fed, would be somewhat cheaper.

Breeders have reported a much better year in sales of breeding stock than that for 1914, in fact they apparently experience difficulty in meeting the demand. The Barred Rock, as yet, seems to hold the preference as an all-round bird, though the White Wyandottes are very close seconds. So far as breeding stock goes the Barred Rocks have given at this Farm a higher percentage of fertile eggs.

INVESTIGATIONAL WORK.

As it was very late before any work of importance could be started last year, due to the fact that the buildings were not ready for the birds until late in December, the experiments as outlined were not as complete as they might have been. However, very good progress is now being made and tests now under way will be continued for at least three years.

COTTON-FRONT HOUSE.

The cotton-front houses built during 1913-14 were the first erected on this Farm. Though they have been used for only two winters it can be said that so far they are proving to be very useful houses for even this most changeable climate. All breeding stock wintered in these houses have given goodly returns considering the circumstances and have come through the winter in excellent condition.

During the winter of 1913-14 the thermometer dropped as low as 27 degrees below zero, yet none of the birds suffered from the frosts. The Leghorns were the only ones that showed any ill effects and even these were not very serious, as only part of them had their combs frozen badly.

During the winter of 1914-15 equally good results have been obtained from the various houses. The houses with two parts cotton and one part glass have given best results so far, proving to be the driest. This type has a floor space of about 114 square feet or 4·5 square feet per bird, a cubic air space of 693·5 cubic feet or 27·7 cubic feet per bird, an area in cotton of 43·3 square feet and in glass 19·1 square feet. The lowest temperature recorded in this house during the winter was three degrees below zero in February, and the highest was 67 degrees in March. More definite data regarding these houses will be available for the next report, as we shall then have the results of three years' work.

NAPPAN.

EXPERIMENTAL FARM, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. S. BLAIR.

POULTRY.

The poultry work at this Station has made fair progress during the season. Mr. C. E. Boulden, who was poultryman, gave up his work to take up studies at Macdonald College, Que., and it was some time before a suitable man was secured. The plant has been increased and the stock, by the addition of good male birds, has been considerably improved. The incubators were placed in the root cellar of the barn, which was not entirely satisfactory.

BUILDING CONSTRUCTED.

The large poultry house twenty-five by eighteen feet has been converted into a feed and incubator building. A cellar was constructed and the building moved to the foundation in a better location. This gives a nice large cellar for the incubators, which was greatly needed. A feed room, egg room and office have also been fitted up in this building.

A new house thirty-two by sixteen feet, for one hundred hens, was also constructed. This is a very satisfactory type of house. It has a shed roof and two-thirds of the front is cotton and one-third glass. It is dry and not too cold.

INCUBATORS.

Two incubators were used during the spring, one the Nonpareil Tamlin and the other the Prairie State. The former has a capacity of 200 eggs and the latter 390 eggs.

CHICKENS.

There were 449 chicks hatched in the spring of 1914. On June 1, there were 323 healthy chickens. After this date a considerable number were taken by hawks, the poultry yards being located near a thick patch of bush which, however, has since been considerably cleared and it is thought this trouble will be largely overcome in the future.

STOCK CARRIED DURING THE WINTER.

The laying and breeding stock carried during the winter was as follows:—

—	Males.	Hens.	Pullets.	Total.
Barred Rocks	10	30	132	172
White Wyandottes	5	14	45	64
Rhode Island Reds	3	4	20	27
White Leghorns	3	3	30	36
Total	21	51	227	299

WINTER RATION FOR HENS.

The whole-grain mixture fed to the hens during winter was as follows:—

300 pounds corn.
100 " wheat.
100 " oats.
100 " barley.

This was fed in deep litter at the rate of three quarts per day for twenty-five birds. The first feed of one quart was given at 8.30 a.m., and two quarts were given at 3.15 p.m. Care was exercised to see that the feed was well cleaned up and in case some was left the feed was decreased.

In addition to the whole grain ration a hopper of dry mash was before the birds at all times. The dry mash was composed of equal parts by weight of wheat, bran, middlings, corn meal and ground oats. After March 1, the dry mash feed was changed to 200 pounds bran, 100 pounds oats, 100 pounds middlings, and twenty-five pounds oil meal. Each pen was also supplied with beef scrap, oyster shell, charcoal and grit.

CRATE FATTENING HENS.

During August twenty-four hens were crate fed for market. These were divided into two lots of twelve each. Lot No. 1 was fed on a meal mixture made up of one pound ground oats, one pound corn meal, one pound middlings and one-half pound beef scrap. This was moistened with water for feeding.

Lot No. 2 was fed ground oats moistened with skim-milk. Both lots were fed one pound three times per day for the first week, and two pounds twice a day for the following two weeks. The feeding period was for twenty-one days. Water was given twice a day.

Weights at start and finish of the test were made after a fasting period of twenty-four hours.

—	Weight at Start.		Weight at Finish		Total Gain.		Average Gain.
	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Oz.
Lot 1	53	8	64	5·75	10	13·75	14·48
Lot 2	55	2	67	4·5	12	2·5	16·1

The meal mixture and beef scrap cost as follows:—

100 pounds oats	$2 00	
100 " cornmeal	1 75	
100 " middlings	1 65	
50 " beef scrap at 4 cents	2 00	
	$7.40	or 2·12 cents per lb.

The feed cost as follows:—

Lot 1.—Seventy-seven pounds mixture and beef scrap at 2·12 cents per pound . . . $ 63
Cost of feed per hen for period . . . 13-58 cents

Lot 2.—Seventy-seven pounds oats at 2 cents per pound . $ 1 54
115 pounds skim-milk at 20 cents per hundred . . . 23 — 1 77
Cost of feed per hen for period . . . 14·75 cents

The poultry sold at 16 cents per pound.
Profit above cost of feed on lot 1, 90 cents per hen.
Profit above cost of feed on lot 2, $1.35 per hen.

It will be noticed that No. 2, the skim-milk and oats ration, is much the better, for, although it cost 14·75 cents per hen for feed as against 13·58 cents for feed per hen for lot 1, the profit per hen was 45 cents greater.

KENTVILLE

EXPERIMENTAL STATION, FREDERICTON, N. B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

POULTRY.

At the beginning of the season the accommodation consisted of three colony houses having cotton fronts and straw lofts. In the early fall two permanent houses of 100 egg capacity each, were erected. An administration building with an incubator cellar was also built. A portable brooder house was built in March, 1915, and a Candee brooder installed.

INCUBATORS AND BROODERS.

There were three incubators used, one Tamlin hot water, 200 egg capacity, one Prairie State hot air, 250 egg capacity, and one Essex hot air machine, 120 egg capacity.

In February, 1915, a 1,200 egg Candee Incubator was installed in the basement of the poultry administration building.

STOCK AND BREEDING.

The stock in the spring of 1914 consisted of 31 Rocks, 22 Single Comb Rhode Island Reds, 14 White Wyandottes, and 20 White Leghorns.

Breeding stock was selected from birds of good type and vigorous constitution having regard to their records for egg production, as shown by our trap nest records. They were mated to vigorous imported males from heavy laying strains.

The number of chickens raised to maturity was 220; the poorer birds were culled out, crate fattened and sold at satisfactory prices. Eleven cockerels were retained on the Station and the rest were sold as breeders.

In December 30 Rhode Island Reds, 35 White Wyandottes, 15 Barred Plymouth Rocks and 30 White Leghorns were purchased to stock the plant to its full capacity.

The breeding stock mated up for 1915 consists of the following pens, viz.:—

Pens 1 and 2, 25 Rhode Island Reds in each mated to two males.

Pens 3 and 4, 25 Barred Plymouth Rocks in each mated to two males.

Pen 5 50 White Leghorns mated to three males.

Pen 6 50 White Wyandottes mated to two males.

Pen 7 10 White Wyandottes mated to one male, bred to lay, strain received from Central Experimental Farm.

EGGS

Eggs were sold at prices ranging from twenty-five cents to thirty-five cents per dozen.

The following table shows the average number of eggs per bird per month with the prices realized. The average covers all ages and though by no means large is a fair record:—

—	Price per dozen.	B. Plymouth Rocks.		W. Wyandottes.		S. C. R. I. Reds.		Leghorns.	
		Eggs.	Value.	Eggs.	Value.	Eggs.	Value.	Eggs.	Value.
1914.	Cents.	No.	Cents.	No.	Cents.	No.	Cents.	No.	Cents.
April	25	15·0	31	16·0	33	14·4	29	16·0	33
May	25	15·0	31	16·6	34	16·5	34	21·1	44
June	25	8·6	17	11·1	23	10·5	22	18·0	37
July	25	11·0	23	15·4	32	11·0	23	15·0	31
August	25	8·6	17	7·0	14	6·2	12	7·0	14
September	25	7·5	15	6·0	12	7·0	14	1·8	03
October	28	2·3	05	7·5	17	10·1	23		
November	35	1·0	03	3·0	09	2·1	06	0·7	02
December	35	1·0	03	1·7	05	3·0	09	2·3	07
1915.									
January	35	2·5	07	2·0	06	2·4	07	3·0	09
February	35	5·7	16	4·6	13	6·8	20	4·0	12
March	30	14·1	35	14·3	35	13·1	32	12·8	32
		92·3	$2 03	105·2	$2 33	103·1	$2 31	101·7	$2 24

FREDERICTON.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

POULTRY.

Experimental work at this Station includes housing, feeding, and breeding, and it is the intention to furnish good stock and eggs at reasonable prices to farmers and other persons interested in aviculture. Attention also will be given to the marketing of the products in an attractive form, as this phase of the work is too often neglected, to the financial loss of the producer.

BUILDINGS.

A very neat and commodious poultry administration building was erected during the year. The dimensions are 18 feet by 26 feet and it has three stories, the basement, where the incubator, egg and killing rooms are placed; the ground floor comprises a mixing room, a bedroom for the poultryman, and a small office where records are kept and visitors received; on the first floor or attic are the feed bins and storage room for appliances, such as detachable brooders, coops, troughs, etc.

The incubator cellar has concrete floor and walls, the latter covered inside with a batting over which is grooved and tongued lumber. Wooden shutters can be let down over the small windows, to stop the radiation of heat or cold, and with this arrangement, the temperature keeps very uniform, having never varied more than four degrees, except on two occasions, during the months of March and April, while the variations outside ranged from five to twenty-eight degrees.

A ventilator of the Rutherford type helps to keep the air of the cellar pure and to control the humidity.

A laying house for 100 hens, 16 feet by 32 feet, was also built, and three colony houses, 8 feet by 12 feet. Thermometers are kept in the large house, also in one of the small houses, and maximum and minimum temperatures are taken twice a day. From these it will be discovered if there is a difference in utility between the deep and narrow houses.

STOCK.

Only one variety is kept, Barred Rocks. This does not mean that it is necessarily the best, but it was deemed advisable to keep just one variety, because there is not the accommodation necessary for more. There are about 125 hens and pullets, and six pens of 15 females each were mated. At the time of writing (April 21, 1915), about 200 chicks are hatched, some being about three weeks old.

EXPERIMENTAL WORK.

No experimental work was undertaken as the different buildings were erected late in the autumn of 1914. Trap nests have been put in all the pens, however, and already a few interesting things have been noted. For instance, some hens nearly always lay small eggs, some others lay eggs which are very often sterile, while others again lay eggs with weak germs. Egg trays have been made with a compartment for each hen,

and we have commenced to weigh the eggs of the different hens. Whether a hen laying small eggs will give pullets also laying small eggs can be found out, with time, but one thing certain is that the hen laying small eggs is not wanted as a commercial proposition. Though eggs are not yet sold by weight, the poultryman who puts large eggs on the market will no doubt keep his customers better than the one who delivers small eggs.

VISITORS.

Nearly all visitors are interested in poultry, as a great number of city people keep a few hens. With a man specially in charge of this work, and a convenient plant, useful information can be given and there is no doubt that the poultrymen of the district will be benefited by what will be done at this Station.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. M. McKILLICAN, B.S.A.

POULTRY.

On March 31, 1915, the poultry flock consisted of the following:

Barred Plymouth Rocks: 15 hens, 35 pullets and 4 cocks.

White Wyandottes: 44 hens, 27 pullets and 6 cocks.

These are housed in six 10 foot cotton-fronted colony houses, which are in use summer and winter, being moved out to the fields in summer, and back nearer to the buildings and shelter after "freeze up." With the curtains up in summer they make cool airy quarters, and with them down in winter the houses keep dry and well ventilated, promoting health and fecundity, often lost in damp, close, airtight houses. Litter is provided to a depth of eight inches for exercise during the coldest weather and all grain fed into it. With a weekly addition of fresh straw and a monthly renewal of the entire material, the surface is kept loose and the grain easily sinks out of sight. A dry mash of chopped grains with a small percentage of meat scrap added is always before the birds. Green food is supplied by roots and alfalfa leaves. Warm water is given in the winter as required. Grit and oyster shell are also fed in hoppers.

During the summer the houses were moved out to open spaces and after breeding was completed all hens ran together, and the cocks were killed. Wheat was fed in the dry mash hopper and a constant supply furnished. The hens did not get too fat and were away from the houses most of the daytime. This method reduces labour to a considerable extent. The hoppers have to be filled only about once in two weeks. Water was given every day, but at whatever time of day was most convenient. A grit hopper was filled with meat meal, but of this very little was eaten, as the birds preferred insects and grubs to the dry meal. With this treatment they laid moderately well.

Hatching was started on April 6th in two incubators, one Cyphers hot-air machine and one Tamlin hot-water machine. Three cockerels had been put into each house and although the eggs were fertile, a large percentage failed to hatch on account of weak germs. This was probably due to the earliness of the season and also to the fact that the hens were confined. No appreciable difference was noticeable in the two styles of incubator but the hot-air machine was a good deal harder to keep up to the correct humidity in the egg chamber. The machines were run in a basement of which the atmosphere was very dry.

Beginning April 24, an experiment was conducted as to the difference between the results from artificial and natural incubation. One hundred eggs were put into a Tamlin incubator and 72 set under six hens. The eggs were as nearly alike in respect to breed and age as possible. The hens hatched out 16·8 per cent more chicks than the incubator, the figures being 61·3 per cent for the hens and 44·5 per cent for the incubator. These figures are based on the eggs remaining after the infertile ones had been removed at the first test.

At this Farm the chickens' enemies are undoubtedly crows and hawks which have taken a large number from one to eight weeks old.

After the chicks were about three months old, they also were fed by the hopper method which was very satisfactory. Young cockerels were moved away from the pullets as soon as the difference could be plainly seen. The first separation was made on August 10.

CONSTRUCTION OF COLONY HOUSES.

Six houses are used on this Farm, all of the portable cotton front type, the size being 10 feet by 12 feet.

Different methods of boarding up the walls were tried to see which would be the best for this climate. All of the houses have proven satisfactory and after this winter's trial, the effectiveness of the open air house has again been demonstrated.

The houses were moved into a well-sheltered spot in the fall and placed in a line as close together as possible, facing the south. A self-registering thermometer was placed in each house and a record of the temperature kept. The houses were numbered from the west to the east, No. 6 house being the most exposed. The following description shows the difference in construction of the houses:—

No. 1.—Tar paper and one-ply of boards with an extra ply of boards on the back.

No. 2.—Double boarded outside of studs all over.

No. 3.—Same as number 1.

No. 4.—Tar paper and one-ply of boards.

No. 5.—One ply of boards on the outside of studs and one ply on the inside of studs.

No. 6.—Tar paper and one ply of boards on the outside of studs and boarded up on the inside of studs just around the roosts.

The following table is representative of the temperature records obtained during the winter:—

TEMPERATURE Records of Colony Houses.

House No.	1.		2.		3.		4.		5.		6.		Outside Temp.	
No. of Birds in House.	34.		28.		35.		21.		22.		21.			
Date.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1915.	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Jan. 2	...	...	...	...	4	36	− 4	30	− 1	24	− 6	23	−15·0	28·0
" 9	...	...	...	...	14	36	2	33	7	24	2	28	− 8·0	
" 13	24	25	24	25	26	32	20	31	21	31	18	28	12·5	17·0
" 11	13	40	7	40	15	48	6	41	11	41	6	38	− 9·5	7·5
" 20	6	28	8	28	...	...	3	24	...	...	0	24	−18·0	2·0
" 23	− 4	30	− 3	28	...	...	−11	16	...	...	−11	17	−30·0	− 6·0
" 24	...	...	...	...	...	...	−12	13	− 8	14	−16	10	−36·0	−11·5
" 27	...	...	...	...	...	...	−20	16	−16	18	−26	12	−45·5	−20·9
" 29	...	...	...	...	− 6	22	...	...	− 8	15	−16	12	−33·5	5·0
" 30	...	...	...	...	10	18	...	...	6	16	−14	11	−14·0	7·0
Feb. 1	...	...	...	...	6	28	...	...	4	25	− 4	22	−20·0	7·0
" 3	...	...	...	...	30	34	...	...	28	32	24	31	20·0	22·0
Mar. 7	18	44	20	43	20	54	14	46	20	60	10	56	2·0	35·0
" 10	16	64	20	64	20	63	14	59	22	94	14	62	10·0	41·0

NOTES.—No 6 was always the coldest but it had fewer hens and was the most exposed.

No. 4 was always the next coldest but it had also few hens and was just enough warmer to allow for its extra shelter.

No. 1 was the third coldest: It was well sheltered by bush and had plenty of birds, but was somewhat damp inside and some of the birds had their feet frozen.

No. 2 gave much the same results as No. 1 except that it was drier and did not have quite as much variation in temperature.

BRANDON.

No. 5 gave the best results of all. It was no warmer than No. 3 but it had a much more uniform temperature than any of the other houses and was a great deal drier.

No. 3 house is the same in construction as No. 1 but was much warmer and drier. This may be explained by the fact that it had the greatest number of birds and was the centre of the row.

The temperatures were also taken on the roosts with the curtains down around the roosts and the difference between the temperature of the house outside the curtain, and the roost, noted. In every case the roost was warmer than the rest of the house, varying from a few degrees up to as high as 20 degrees. These results show that it is preferable to have a curtain to drop in front of the roost on really cold nights. Since the temperature can be kept from 10 degrees to 20 degrees warmer with a curtain it is well worth the trouble as it adds considerably to the comfort of the birds.

A record has been kept of the number of eggs laid by the hens in each house but no influence on egg production can be traced to the effect of the houses as differences in strain and age of the birds were more effective factors in determining the number of eggs laid.

PULLETS *versus* OLD HENS AS LAYERS.

Beginning on November 1, records of the eggs laid by the pullets and hens of each breed were kept. The Wyandotte pullets commenced to lay on November 13 and the Rock pullets on November 19. From this time on during the entire winter, the pullets gradually increased their egg production and the hens fell off in theirs till about the end of January. This shows that the pullet is essentially the winter egg producer. Another fact very noticeable here is that the White Wyandottes were much superior to the Barred Rocks as winter layers, but about February 15 the Rock pullets began to lay better and have kept up fairly well since then, although they have as yet at no time equalled the Wyandottes.

ROCKS *versus* WYANDOTTES.

There are several factors which may have influenced the egg production of these two breeds during the past winter:—

1. The Wyandottes are probably a better laying strain of their breed than the Rocks are of their breed.

2. Nineteen of the thirty-five Rock pullets were shipped from Ottawa, arriving here on October 17, and although they arrived here in good condition, it took them some time to become acclimatized.

3. The Rock hens were in an over-fat condition and the winter was well advanced before they could be made to exercise themselves sufficiently to keep them in laying condition.

4. The pullets of each breed were practically the same age, but the Wyandotte pullets seemed to mature earlier than the Rocks.

The birds were all fed the same rations, they all had the same sized runs, and were kept under as nearly the same conditions as possible.

BRANDON.

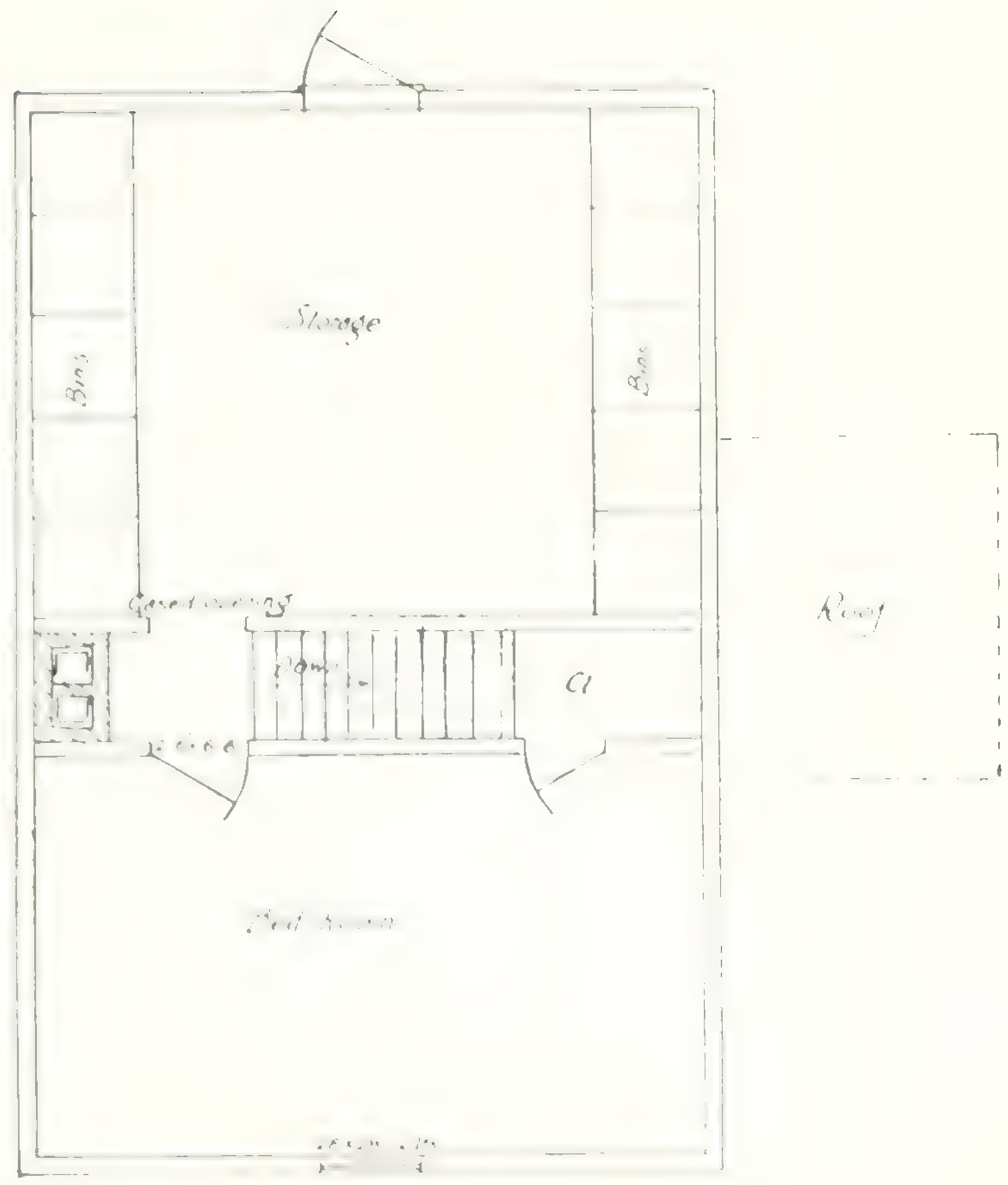
Permanent House for 100 hens, Nappan, N.S.

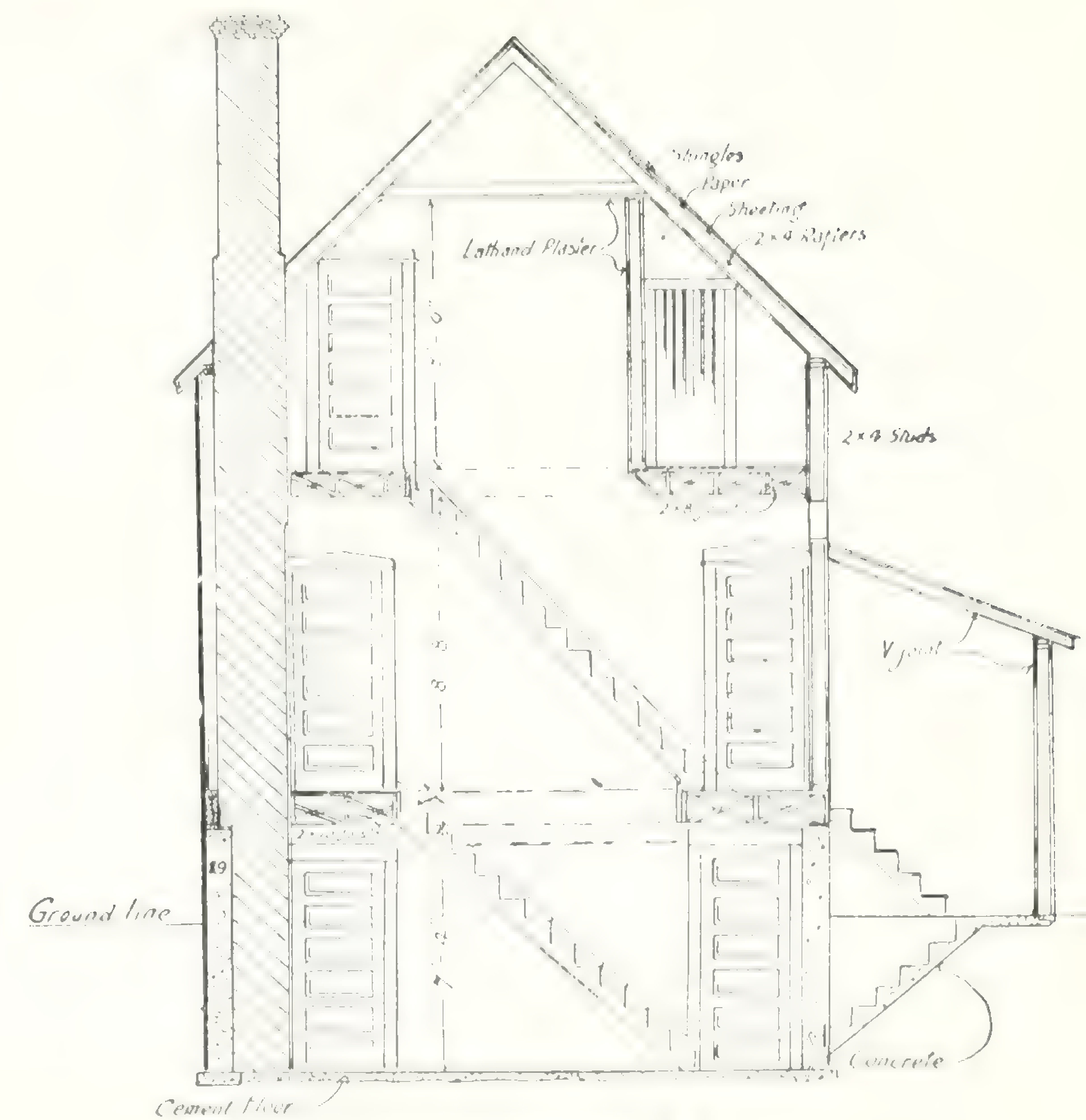
16—1916—71a.

16—1916—71½a.

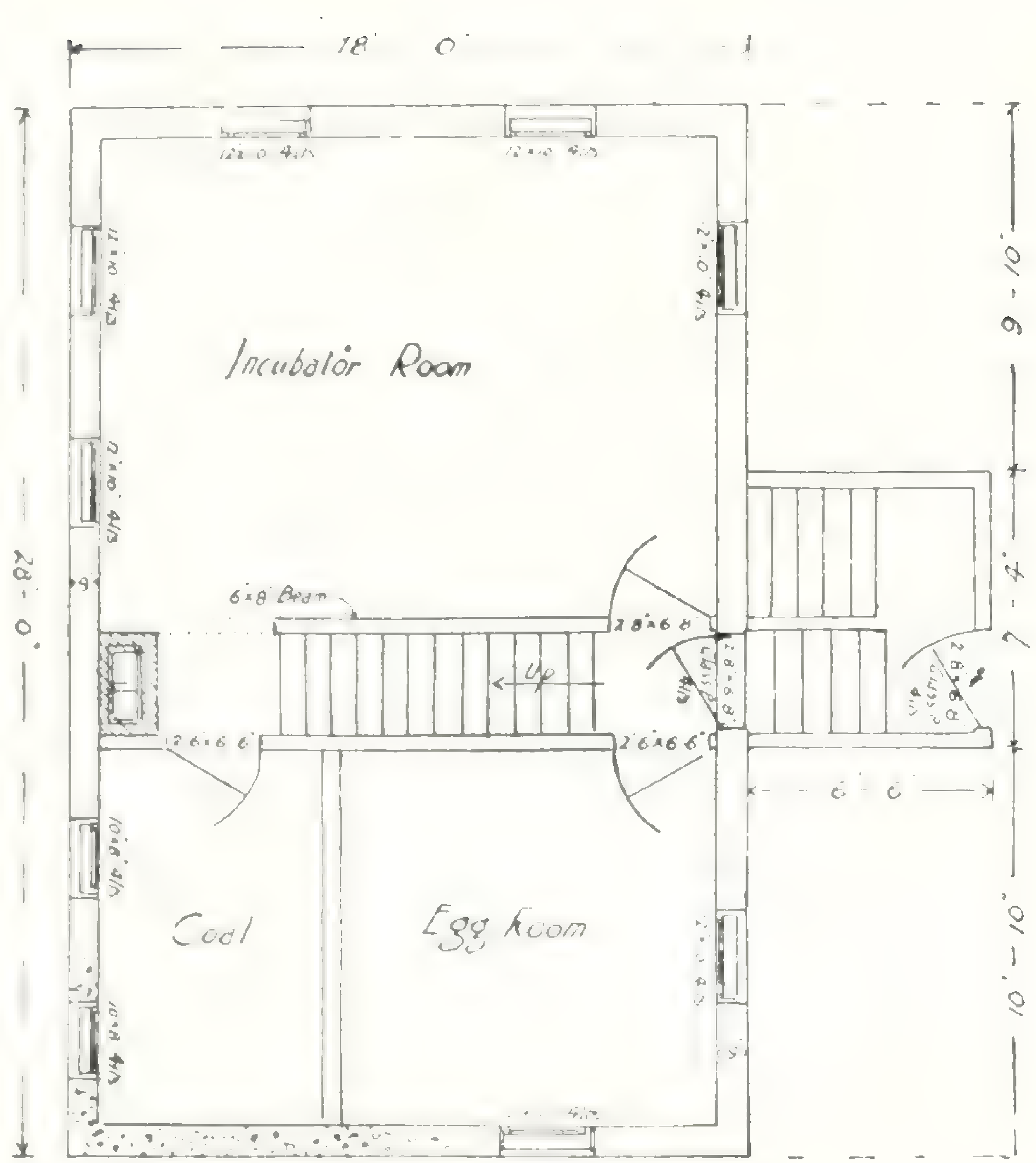
POULTRY ADMINISTRATION BUILDING.

¼ IN SCALE

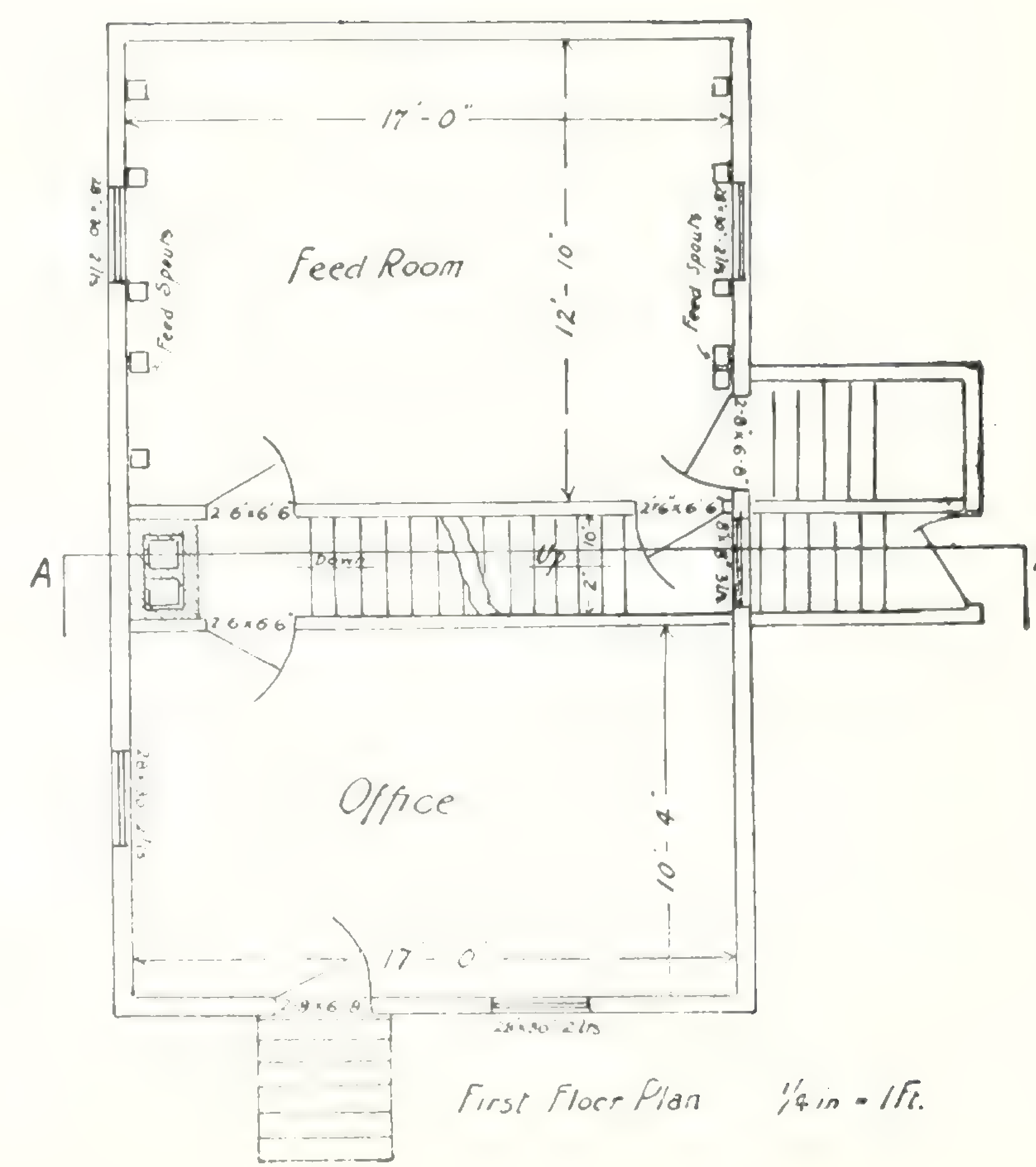




POULTRY ADMINISTRATION BUILDING.



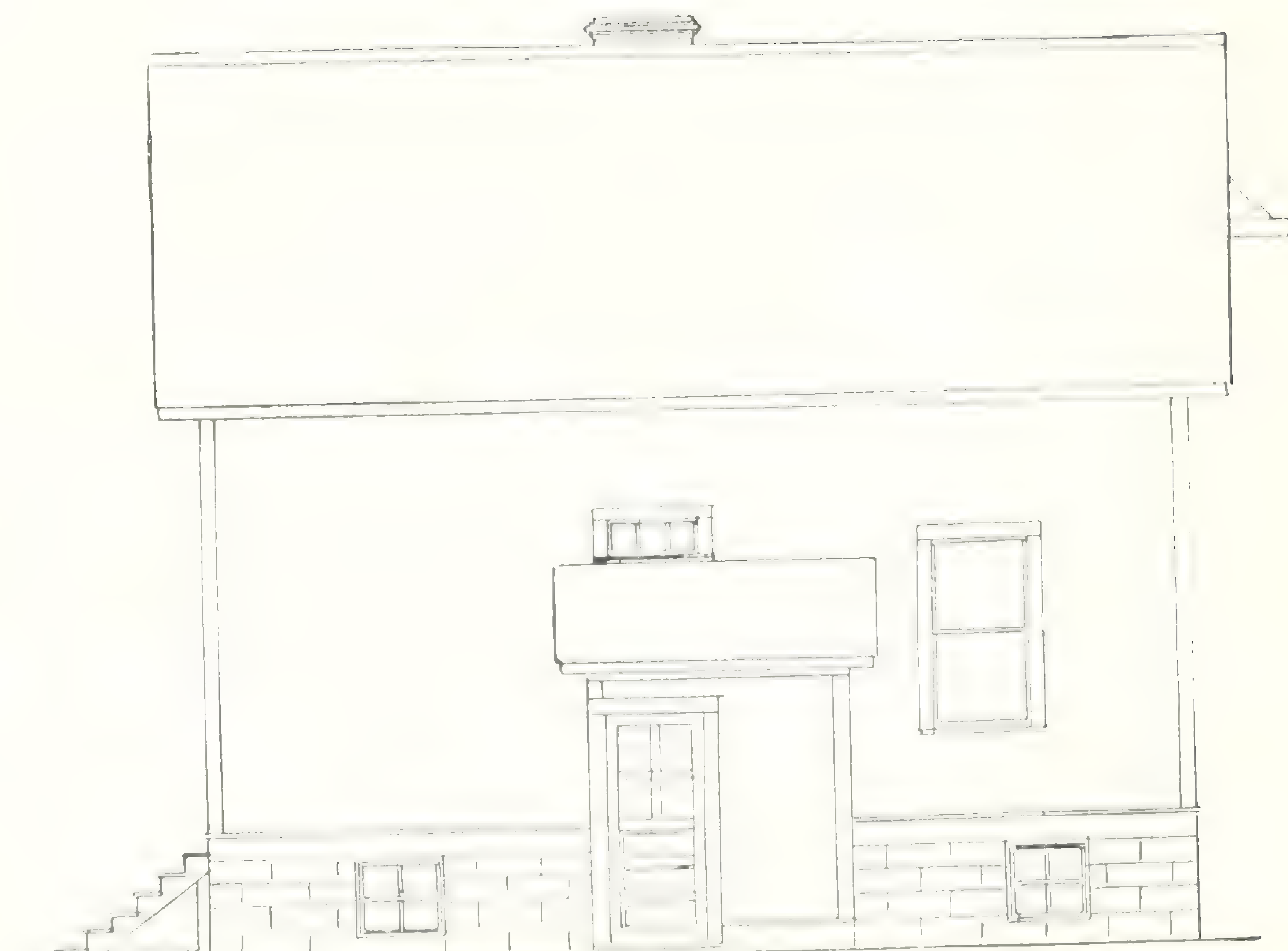
Basement Plan



First Floor Plan 1/4 in = 1 Ft.

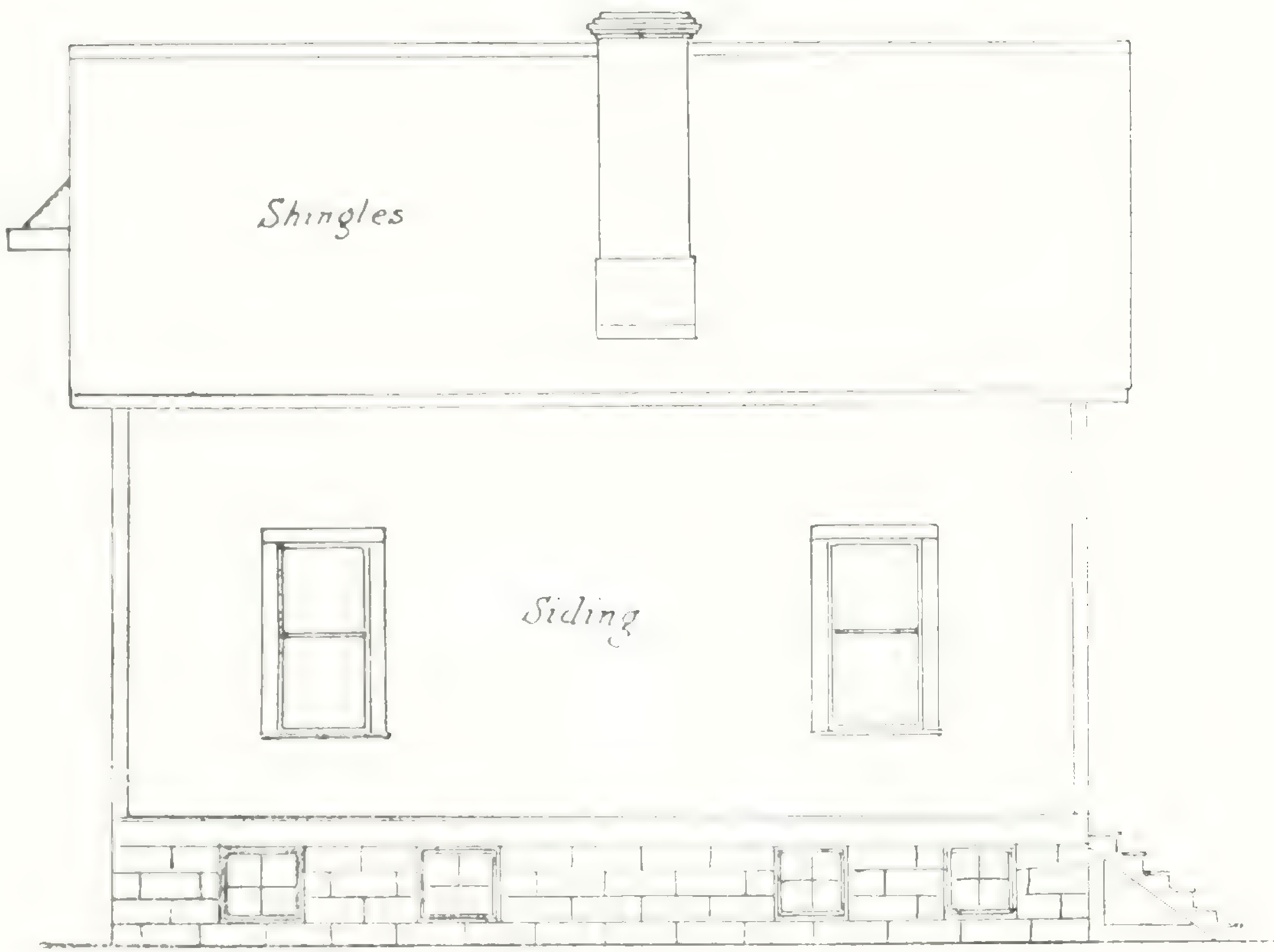
POULTRY ADMINISTRATION BUILDING.

Front Elevation

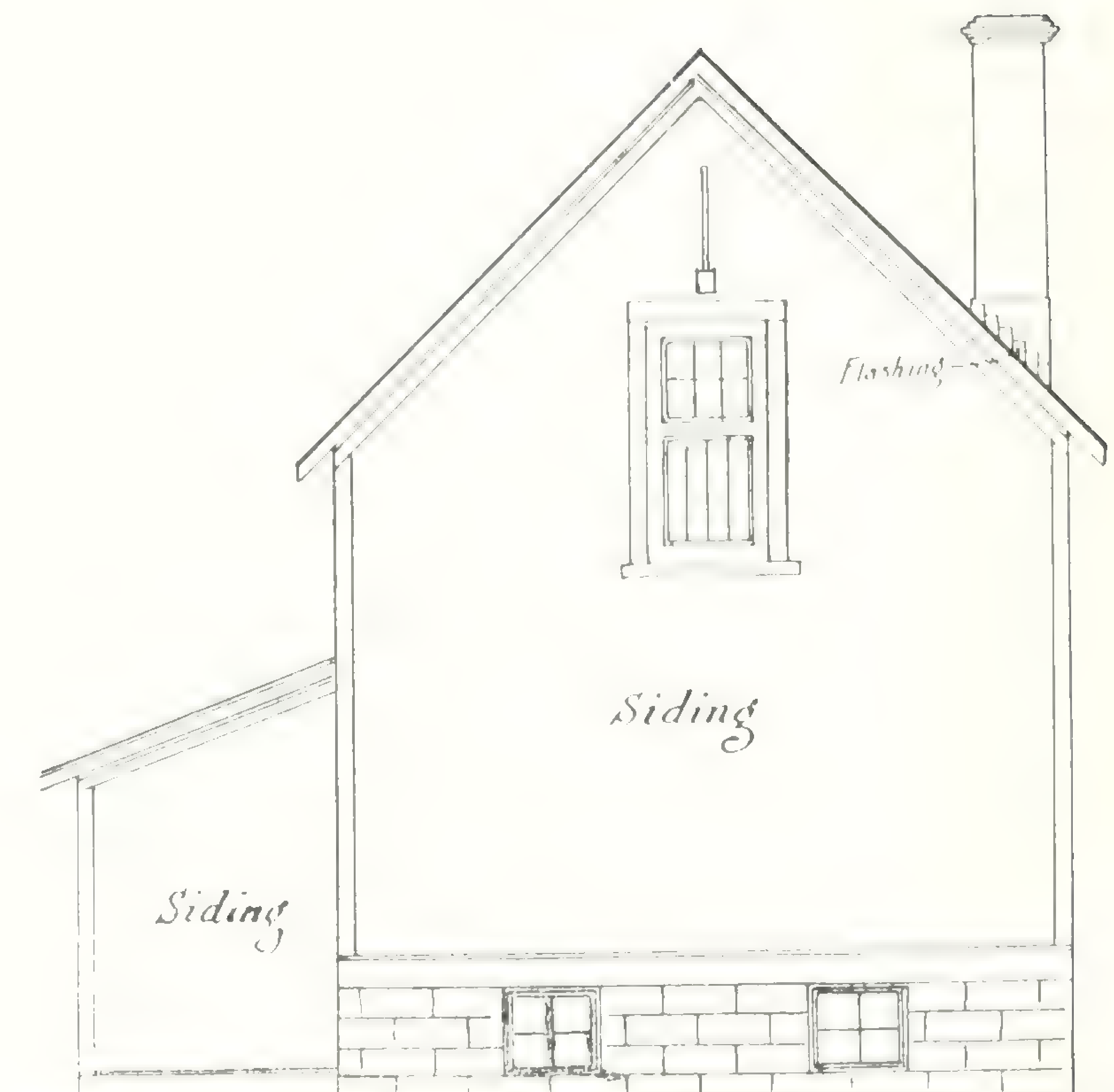


Right Side Elevation.

Poultry Administration Building.



Left Side Elevation.



Rear Elevation

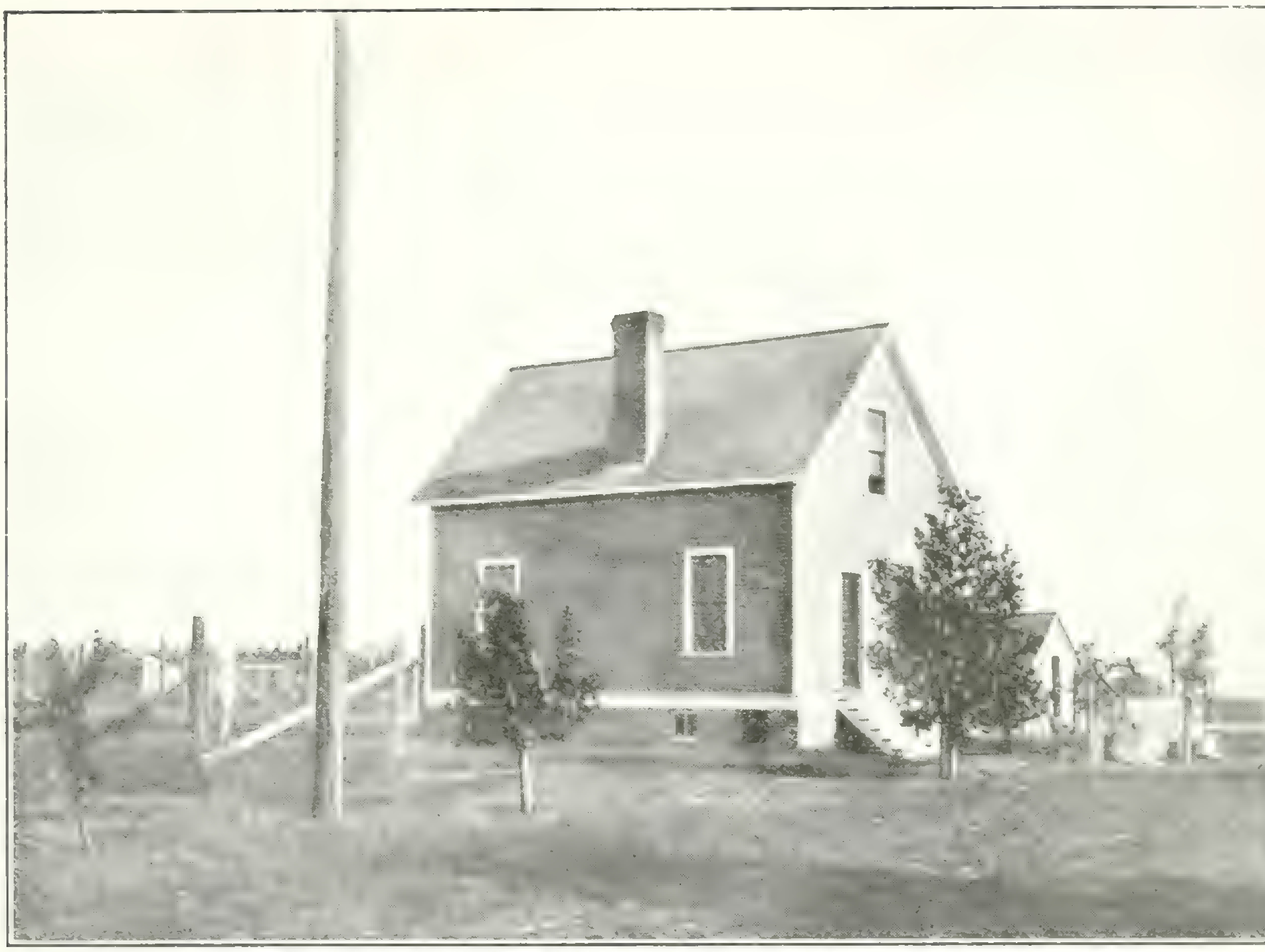


FIG. 7. Poultry Administration Building at Lethbridge, Alta. (front and south side).

FIG. 8. Poultry Administration Building at Lethbridge, Alta. (entrance from plant).

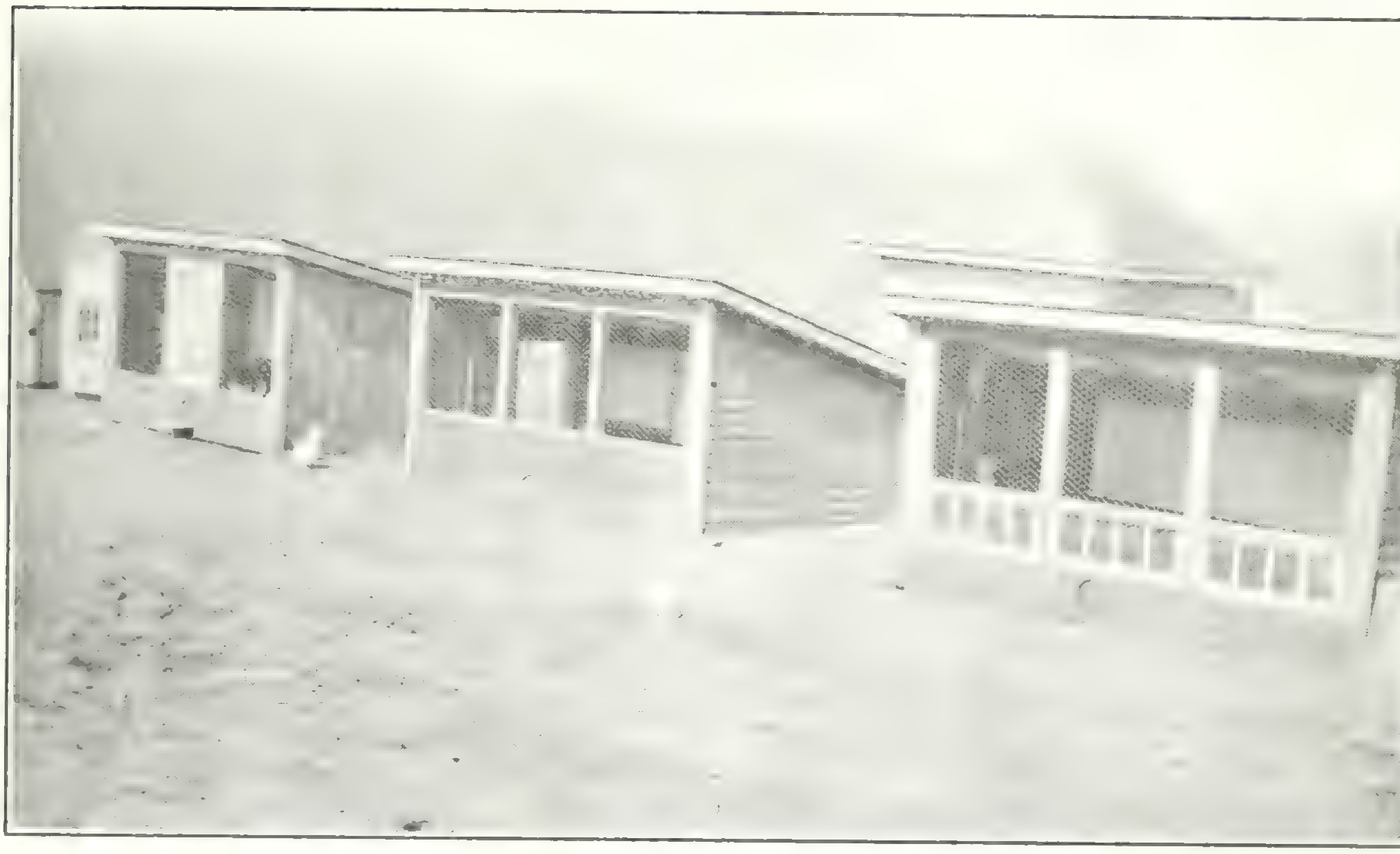


FIG. 21. Colony laying houses used at Indian Head.

Some early hatched White Leghorns. Photograph taken May 26, hatched early in March, English Strain, Lethbridge, Alta.

Agassiz, B.C., Poultry Plant. Breeding pens in front.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE ASSISTANT TO THE SUPERINTENDENT, K. MACBEAN, B.S.A.

POULTRY.

Two breeds of poultry are kept on this Farm. These are the Barred Plymouth Rocks and White Wyandottes. The reason of their choice over other breeds is due to their suitability to prevailing conditions in this district.

The strains in both breeds are practically new to this Farm, representatives of each having been introduced from Eastern Canada a year ago last fall while another shipment of Barred Plymouth Rocks and White Wyandottes followed last fall, also from the East.

The flock now consists of fifty-four Rocks and sixty-two Wyandottes.

Owing to the fact that most of the birds are practically strange to our conditions, results therewith are not conclusive, but the fact that the egg yield this past winter has been better than that of last, leaves the inference that, as the birds become acclimatized, results will be more favourable.

Previous to last fall's shipment of birds from Eastern Canada, it was decided to cull out rigidly all inferior birds in the existing flock. Those culled out were crate fed and sold, an experiment to compare different fattening rations being carried out with a view to determine the value of the various feeds.

BUILDINGS.

There being no permanent poultry building installed as yet at this Farm the birds are all housed in colony houses. There are four of these, two being large enough for twenty-five birds each, the other two having accommodation for forty birds each.

While the houses are similar, the following differences are worthy of note:—

No. 1 house: Building paper and one ply lumber (two ply round roost space), one sash glass, two cotton frames, board floor and shingle roof.

No. 2 house: Two ply lumber, tar paper between, all-cotton front, earth floor, shingle roof.

No. 3 house: Two ply lumber, tar paper between, cotton front and also glass 14 inches wide full length of front, earth floor, shingle roof.

No. 4 house: Two ply lumber, tar paper between, roost space sealed inside with beaver board, board floor, ruberoid roofing, all-cotton front.

To make reliable comparisons between the houses a thermometer was kept in each, all winter, but as the weather was extremely mild, no striking differences were noted and the birds thrived equally well in all houses.

The following table shows the variations in temperatures in the different houses:—

Variation in Temperature of Houses.

	December.		January.		February.		March.		April.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
House No. 1	30	21	42	28	44	4	52	0	96	20
" 2	28	14	39	18	38	16	54	8	88	22
" 3	28	14	36	22	32	8	52	2	84	24
" 4	28	22	40	28	36	6	56	0	94	22

EGG YIELD.

The egg yield varied slightly in the various houses but this was attributed, not to the superiority of one house over another, but rather to the better strain of birds in the respective houses.

In this connection it is worthy of note that the Wyandottes are excelling the Plymouth Rocks in egg production and, therefore, an effort will be made to bring out all the possibilities of this breed since this Farm seems to be fortunate in possessing a good strain of laying Wyandottes.

METHODS OF HANDLING.

Pullets are kept in houses separate from hens. Trap nests are used in recording the yield of the individual pullets but not in the case of hens. As a result of trap nesting the pullets, only such as come up to a good standard are retained in the flock, their eggs the succeeding year being used for hatching purposes. Pullets that do not come up to a desirable standard are culled out and fattened. Birds are usually kept two seasons only, as pullets and one-year old hens, but in cases where they have proved to be exceptionally good birds they are retained a third year and then not for the number of eggs they may yield, but that a supply of desirable eggs may be obtained from them for hatching purposes. By this means it is possible to keep both flocks up to a high standard.

All chicks are hatched by incubators, of which we have two, viz., the Tamlin and Prairie State. These have been in use two seasons and both have given good results, the number of chicks hatched out this spring being one hundred and twenty-nine Rocks and one hundred and sixty-nine Wyandottes.

INCUBATION AND BROODING.

There are five brooders in use. Those of the adaptable type were satisfactory when the lamp was placed inside the brooder house. At the outset the brooders only were placed inside with chimney connecting brooder to lamp placed outside the house. This method was very unsatisfactory due to the fact that an occasional high wind would spring up and extinguish the lamp. The method of placing the whole equipment inside the brooder house was resorted to, and good success was the result, no appreciable effect of lamp fumes on chickens being observed.

Experience with all the hovers was such that we placed the whole equipment inside the respective brooder houses.

In conjunction with the two small portable brooder houses, two colony houses are also being utilized for the raising of the chickens.

SUMMER CONDITIONS.

When the breeding season is over all the hens are allowed to run together, two houses being sufficient to accommodate those selected for the upkeep of the flocks, while those culled out are put into the fattening crates. The other two houses are thus available for the raising of the chickens and are transformed into brooder houses.

The poultry runs are situated partly in a cultivated orchard while one end of these runs is taken up with an old alfalfa patch where there is an abundance of green feed available.

INDIAN HEAD.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

POULTRY.

In 1914 a start was made with poultry at this Station. During the latter part of the winter of 1913-14 three incubators were purchased and installed in one end of a "dug out" root cellar and although we did the season's hatching with the incubators located there we found that it was not very satisfactory owing to the difficulty of keeping the temperature of the room sufficiently high, and of supplying proper ventilation.

As we obtained no fowls to start with, all the eggs used were shipped in from a considerable distance, except some Single Comb White Leghorn eggs which were purchased locally. The eggs were supplied principally from the Central Experimental Farm, Ottawa, and from the Station at Lacombe, although some were shipped from the Farm at Agassiz.

BUILDINGS AND FENCING.

During the summer the following buildings were constructed: An administration building, a one and a half storied structure, 18 by 28 feet, with full basement. In the basement is an incubator room, an egg room and a small room for the storage of coal. On the ground floor is an office and feed room, and on the first floor a bedroom for the attendant, and a room for storage.

A brooder house 14 by 28 feet was built with a centre division making two rooms of equal size. One room was used for brooding and in it was placed a coal-oil brooder stove, the other for a scratching place for the chicks.

A one hundred hen permanent house, and two fifty hen portable houses were built. The one hundred hen house was 16 by 32 single boarded, except adjacent to the roosts, with a front part cotton and part glass. The portable houses were built half as long and similarly constructed except in regard to some minor points. A floor was put in one of the portable houses but not in the others. The average temperature in the floored house was lower in extremely cold weather than was the case when the earth floor was used. In our dry climate there appears to be no disadvantage in not using any artificial floor.

About three acres containing a row of cottonwood trees and a row of caragana on three sides were fenced with a woven wire fence. In addition to this some cross fences were put up as well as fencing for a number of runs.

STOCK.

The incubating was started rather late and for various reasons the number of chickens obtained was somewhat limited. There were in all 310 chickens matured, 100 of the best pullets were saved and the balance were chiefly disposed of by fattening and selling locally. These 100 pullets saved consisted of 60 Single Comb White Leghorns and 40 Barred Rocks. This stock was added to in the Fall by 40 Single Comb White Leghorn hens of good English stock and six cockerels and 60 Barred Rock hens and six cockerels, thus bringing the stock up to 100 each of Single Comb White Leghorn and Barred Rock hens.

WINTERING.

As has been stated the houses were all single boarded except adjacent to the roosts and dropping board. In front of these is a cotton curtain which was let down at nights during severe weather. The Barred Rocks were kept in the permanent hen house and the Leghorns in the two portable houses. All pullets were trap-nested and a careful record kept. The lowest temperature during the winter was 18·0 degrees recorded above roost in the portable house with board floor. The other houses showed a minimum of at least 3·0 degrees higher. The difference in temperature inside, *i.e.,* beneath the curtain, and outside of roosts clearly showed the value of this curtain.

The poultry wintered in a satisfactory manner. The coldest outside temperature was 26·5 below zero and in one case only was a comb frozen to any extent, viz., in the case of a Single Comb White Leghorn male bird.

FEEDING.

A deep litter of four inches to six inches of straw was kept constantly on the floor of scratching pen, in which whole grain, consisting of wheat and some oats was scattered night and morning. A wet mash composed of equal parts of wheat, oats and peas, was given once a day, and a dry mash, usually accessible, composed of ground peas and barley meal. Cut green bone was supplied daily, when obtainable, about one-half an ounce per bird daily being fed. Green feed consisted chiefly of turnips supplemented by a daily supply of alfalfa.

The work this year has necessarily been of a preliminary nature, but we feel that it is well started and that the notes relative to trap nesting, feeding, incubation, etc., now started will be of value and interest another season.

LETHBRIDGE.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

POULTRY.

The number of poultry at this Station on March 30, 1915, is 253 hens, 22 ducks, 9 geese, and 16 turkeys, all of which are in good health and laying well.

A number of improvements have been made during the year, including the erection of a six foot fence around the yards, and alterations in the straw house and in the long frame house. Under the arrangements first provided in the incubator cellar the machine smoked and it was necessary to erect a new chimney, but the trouble in this connection is now over. A coal oil brooder used in 1914 has been displaced by a coal heater. The coal oil heater was expensive to operate, while the coal heater is much more dependable and can be operated at a cost in average weather, of from twelve to fifteen cents per day.

TEMPERATURE IN FRAME *versus* STRAW HOUSE.

Records were kept of the temperatures in the large frame house which accommodated about one hundred birds and in the straw house which has a floor space for about eighty birds. During the latter half of January, through February and the latter half of March, while the temperature was higher in the frame house the birds in the straw house did not suffer.

FRAME *versus* STRAW HOUSE.

FRAME HOUSE.

1915.	Average Maximum. Temperature.	Average Minimum Temperature.	Mean.
	°	°	°
January	33·8	16·9	25·4
February	38·5	24·6	31·6
March	44·0	24·4	34·2

STRAW HOUSE.

1915.	Average Maximum. Temperature.	Average Minimum. Temperature.	Mean.
	°	°	°
January	26·6	5·7	16·2
February	33·9	12·3	23·1
March	40·4	14·2	27·2

HATCHABILITY OF EGGS FROM DIFFERENT HOUSES.

Eggs from various houses have been set and records kept with the object of establishing a relation, if such exists, between the character of the house and the hatchability of eggs produced in it.

VARIATION OF HATCHABILITY.

House.	Breed.	No. Set.	Hatched.	Per cent hatched.
Long	Buff Orpington, Barred Rock, Rhode Island Red, White Wyandotte	365	141	38·6
Square	Buff Orpington	167	95	56·9
Log	Rhode Island Red	290	153	52·7
Straw	Rhode Island Red, Barred Rock, Buff Orpington. White Wyandotte	303	94	31·0

NOTE.—The different breeds have much to do with the variations in egg hatchability.

COST OF OPERATING INCUBATORS AND PERCENTAGE OF EGGS HATCHED.

The equivalent of one hatch has been brought out in the Candee machine which has a capacity of 1,200 eggs, one hatch in one of the Cyphers machines and two in the other Cyphers, both having a capacity of 140 eggs each.

The nut coal used in operating the Candee machine cost $8.50 per ton, and 20 pounds per day were required. The Cyphers machines each require one quart of coal oil per day. The coal oil costs at the rate of 23½ cents per gallon. The above are cost items used in determining the cost per hundred eggs to operate and the cost of one hundred chickens hatched in the different incubators in the following table:—

COST PER CAPACITY AND PER NUMBER OF CHICKS HATCHED.

Incubator.	No. of eggs set.	No. of eggs hatched.	Percentage hatched.	Cost per 100 cap. to operate.	Cost per 100 chicks hatched.
				cts.	$ cts.
Candee 1 hatch	1,121	517	46·1	14·8	0 35
Cyphers 3 hatches, 2 machines	433	183	41·4	88·12	2 09

LACOMBE.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

POULTRY.

Under the management of Mr. V. Kuhn the extent of the work in poultry has been considerably increased during the year. As before we have limited ourselves to the two breeds, White Leghorns and Barred Plymouth Rocks. In addition we have kept some ducks and squab pigeons have also lately been added to the stock.

STOCK.

The total number of birds kept was 468. These were divided as follows:—

Variety.	Hens.	Pullets.	Totals.
White Leghorns	190	102	292
Barred Plymouth Rocks	42	91	133
Males of both breeds	15	....	15
Ducks	8	....	8
Pigeons	20	....	20

The high prices of feed and the low market value of poultry products have been intensified this year and experiments have been directed towards the cutting down of the cost of production. The results of the work are grouped under three heads: Production, Breeding and Experimental Feeding.

PRODUCTION.

The flock was not divided to the best advantage for egg production this year, since over one-half of the stock kept consisted of old hens. The egg yield per month for the year was as follows:—

Month	Eggs	Month	Eggs
April	5,568	October	1,162
May	4,183	November	733
June	3,608	December	1,733
July	3,197	January	2,893
August	2,696	February	4,029
September	1,695	March	6,641
Totals	20,947		17,191

The average yield per bird was 89·7. This figure is computed from the total number of females in the pens: The range, according to the record from the trap-nests, was from 210 by the best, to 44 by the least productive, during the whole year. The larger number of summer as compared to winter eggs was due to the predominance of old hens, which laid the major portion of their eggs during the summer.

EARLY AND LATE PULLETS (LEGHORNS).

A comparison is given here between the performance of early-hatched White Leghorn pullets taken off the range September 12, and that of late-hatched pullets of the same breed, taken off the range October 11.

Early *versus* Late Hatched White Leghorn Pullets.

—	Early hatched.	Late hatched.
Number of birds in pen	49	53
Number of days in trial	170	151
Amount of grain fed, lb	1,311	1,449
Amount of green food fed, lb	300	102
Amount of skim milk fed, lb	855	565
Total number of eggs laid	1,618	1,054
Weight of eggs, oz	3,132	2,066
Weight per doz. of eggs, oz	25·2	23·5
Number of days per hen per doz. eggs	61·7	90·9
Pounds of grain per doz. eggs	9·72	16·48
Pounds of grain per lb. of eggs	6·69	11·22
Pounds of green food per doz. eggs	1·47	1·15
Pounds of skim milk per doz. eggs	6·26	6·43
Cost to produce 1 doz. eggs	21·5 cts.	34·9 cts.
Cost to produce 1 lb. of eggs	14·9 cts.	24·4 cts.
Per cent. of fertile eggs	85·8	
Per cent. fertile eggs hatched	57·1	
Per cent. of total eggs hatched	49·0	

The extremely high prices paid for feed during the winter months put the cost of production very high, but this fact proves the absolute necessity of keeping only the best producers.

From an egg producing point of view, with White Leghorns, it would appear that it is better to hatch them early and let them get their full growth on the range, before putting them into laying pens.

EARLY AND LATE PULLETS (BARRED ROCKS).

The same comparison was made between Barred Plymouth Rock pullets of early and late hatchings. The pullets used in this trial were of mixed strains.

Early *versus* Late Hatched Pullets.

—	Early Hatched.	Late Hatched.
Number of birds in pen	46	45
Number of days in trial	170	149
Amount of grain fed, lb	1,897	1,557
Amount of green food fed, lb	371	331
Amount of skim-milk fed, lb	1,530	1,008
Total number of eggs laid	2,242	1,617
Weight of eggs, oz	4,387	3,182
Weight per doz. of eggs, oz	23·48	23·54
Number of days per hen per doz. eggs	41·85	49·89
Pounds of grain per doz. eggs	10·15	11·58
Pounds of grain per lb. of eggs	6·19	7·88
Pounds of green food per doz. eggs	1·98	2·44
Pounds of skim-milk per doz. eggs	8·2	7·49
Cost to produce 1 doz. eggs	23·98c.	25·62c.
Cost to produce 1 lb. of eggs	16·32c.	17·42c.
Per cent. of eggs fertile	80·3	
Per cent. of fertile eggs hatched	40·3	
Per cent. of total eggs hatched	32·3	

AGASSIZ.

In the case of the Barred Rocks also, the early hatched pullets gave the more profitable returns, but there was not as much difference with this breed as with the White Leghorns. In the pen of early hatched pullets, one cockerel was run to twenty-three birds. We attribute the very poor hatching to the large number of pullets, the feeding for egg production, and continuous close confinement without shade during the breeding season.

PULLETS *versus* HENS.

Early hatched White Leghorn pullets were compared as to performance with their mothers, two years old.

Pullets *versus* Hens for Egg Production.

—	Pullets.	Hens.
Number of birds in pen	49	64
Number of days in trial	170	120
Amount of grain fed, lb	1,311	1,396
Amount of green food fed, lb	200	244
Amount of skim-milk fed, lb	855	666
Total number of eggs laid	1,618	818
Number of days per hen per doz. eggs	61·7	112·6
Pounds of grain per doz. eggs	9·72	20·4
Pounds of green food per doz. eggs	1·47	3·58
Pounds of skim-milk per doz. eggs	6·26	5·25
Cost to produce 1 doz. eggs	21·5c.	41·7c.
Per cent. eggs fertile	85·8	80·3
Per cent. of fertile eggs hatched	57·1	43·3
Per cent. of total eggs hatched	49	34·8

From the above figures we must conclude that pullets only should be relied on for winter egg production. The strong healthy pullets in this instance gave better fertility and hatchability than did their mothers.

SELECTED AND UNSELECTED PULLETS.

We give also a comparison between two lots of Barred Plymouth Rock pullets, both late-hatched. One was a selection of pullets bred on this Farm for a number of years, and the other was composed of mixed strains. They were all hatched and raised together.

Selected *versus* Unselected.

—	Selected birds.	Mixed strains.
Number of birds in pen	20	25
Number of days in trial	147	151
Amount of grain fed, lb	974	5[illegible]3
Amount of green food fed, lb	189	233
Amount of skim-milk fed, lb	459	550
Number of eggs laid	817	800
Weight of eggs, oz	1,633	1,549
Weight per doz. of eggs, oz	23·8	23·2
Number of days per hen per doz. eggs	43·4	56·6
Pounds grain per doz. eggs	8·56	14·6
Pounds grain per lb. eggs	5·71	10·05
Pounds of skim-milk per doz. eggs	6·74	8·25
Cost to produce 1 doz. eggs	19·75c.	31·49c.
Cost to produce 1 lb. of eggs	13·17c.	21·67c.

In a year such as this, with high price of feeds, it certainly paid to cull a flock, and to keep only those of known egg-laying strain.

AGASSIZ.

BREEDING.

The breeding stock this year was carefully selected, and we bred as far as possible from the best strains we had. We have trap-nested two lots of pullets, but as these do not finish their year till next autumn, we do not know exactly how they are going to produce. So far there is a great variation, depending upon their breeding. As a rule, however, those which started laying earliest in the autumn have done the best work.

This year we received from the Central Experimental Farm, Ottawa, five bred-to-lay White Leghorn cockerels, and from the Maine Experiment Station, one bred-to-lay Barred Plymouth Rock cockerel. These we used for the improving of our own strains.

In view of the recent discussion concerning the number of hens which could be mated to one cockerel, we this year increased the proportion of females to males. It is possible that the poor results of this change of method were due to factors which we could not control, such as shortage of green feed, lack of shade, etc.; but the fact remains that the percentage of chicks was lower than usual. Also, in one pen, where fewer hens were put to one cock, the fertility and hatching power were far greater than in the other pens. We cannot claim that these results are conclusive, however, since the trial was not sufficiently extensive. More work could profitably be done on this question. Below we give in tabulated form the performance of two pens: One contained five hens to one cockerel, the other thirty-two.

Five *versus* Thirty-two Females to One Cockerel.

—	One cockerel and five hens.	One cockerel and 32 hens.
Percentage of eggs fertile	92·9	80·3
Percentage of fertile eggs hatched	78·7	43·3
Percentage of total eggs hatched	73·2	34·8

Both of these pens were composed of old hens, and the two cockerels used were full brothers. The figures represent the average of the whole season, and the hatching results of four different incubators.

INCUBATORS.

There are five makes of small incubators in use here, Prairie State, Jubilee, Tamlin Nonpareil, and two Cyphers. They were all run in a small cellar, the temperature and humidity of which were uniformly good throughout the season. Last year we gave a detailed report of the cost of raising chicks, calculating on the initial cost of the machine, and the quantity of oil used at 30 cents per gallon. This year we obtained oil at a cost of 22 cents. The following are the averages of three hatchings:—

Cost of Incubation.

—	Prairie State.	Jubilee.	Tamlin Nonpareil.	Cyphers No. 3 Avg. of two.
Capacity of machine, eggs	130	100	100	350
Cost of machine	$30	$25	$35	$52
Average gal. of oil for 21 days, gal	2·85	2·65	2·75	4·16
Average cost per 21 days oil at 22 cents per gal	62.05c.	59.05c.	60.05c.	91·05c.
Average cost of oil per chick hatched	1.15c.	1.06c.	1.37c.	0.68c.
Average cost per chick, calculating 10% cost machine.	1.84c.	1.48c.	2.65c.	1.29c.
Average total cost per chick	2·99c.	2·54c.	4·02c.	1·97c.

AGASSIZ.

The average cost of all machines last year was 2·81 cents per chick with oil at 30 cents. This year, the lower price in oil (22 cents) about counterbalanced the poorer hatch, for the average cost per chick was 2·88 cents.

REARING.

In connection with the breeding work also, we are able to give figures on the cost of raising chicks to five weeks of age, under a Candee Stove Heater. After five weeks they were fit to be put on the range and eat a mixed grain ration.

Cost of Rearing Chicks to Five Weeks.

No. of Chicks.

Number of chicks put under hover		369
Number of chicks lost first week		37
Total number lost		43
Total number reared		326

Temperatures.

Max. temp. of hover	107·7 degrees; of room	76·8.
Min. "	87·0 " "	55·4.

Fuel.

Coal used for period, 354 pounds at $12		$ 2 12

Food.

Bread eaten for period, 21 pounds at 3 cents	$ 63	
Rolled oats for period, 28 pounds at 4 cents	1 12	
Mixed grain for period, 441 pounds at 2 cents	8 82	
Skim-milk for period, 540 pounds at 25 cents	1 35	
Boiled rice for period, 20 pounds at 5 cents	1 00	
		$12 92

Eggs and Incubation.

Total cost of eggs used	$22 17	
Total cost of incubation	9 39	
		$31 56
Total cost of 326 chicks to five weeks of age		46 60
Total cost per chick five weeks old		14·2c.

The chicks were brooded in a cotton-front poultry house and after the first week, practically all the cotton was raised, thus giving them open air conditions throughout the trial. The coal brooder stove gives excellent satisfaction.

EXPERIMENTAL WORK.

In connection with some experimental work which is not yet ready to publish, some trials were run through to test the effects of certain well-known feeds when fed exclusively. The table below gives the details of the trials, and needs no further comment. The fowls were kept in open-front colony houses, and given plenty of floor space, but were not allowed out. The food for each pen was carefully weighed every day, and the fowls were given just as much as they would consume and were supplied with abundance of clean water. The base ration consisted of wheat, corn, oats, barley, and peas. The starvation ration consisted of the same material but in a minimum quantity. That is to say, the fowls in this pen (No. 11) received each day a portion of the full base ration, equal to the minimum amount consumed by any of the pens on the day previous.

AGASSIZ.

The addition of Inorganic Phosphorus to Poultry Rations. Feeding period seventy-nine days.

No. of pen.	Ration fed.	Food consumed.	Individual Numbers of the Birds and Weights. No.	At beginning.	At end.	Change in weight.	No. of eggs laid.	Condition of eggs laid.	Remarks.
		lb.	lb.	lb.	lb.	lb.			
1....	Wheat flour, best grade, baked in cakes.	6	46 48 79	3·7 4·6 3·5	All died.	....	....	....	After 31 days, birds all became weak in the legs. Ate sparingly and gradually became comatose. They were all dead on the 46th day.
2 ..	Wheat flour, best grade, baked, and inorganic phosphorus.	8·125	90 91 219	4·1 3·8 3·7	3·4 2·15 1·9	−4·15	3	Small, yolk white...	Two birds died with the same symptoms as those in pen 1. Bird No. 90 recovered and laid eggs, but showed leg weakness.
3....	Ground wheat, baked in cakes	15·0	92 94 95	4·2 3·3 2·9	3·7 3·2 1·8	−1·7	4	Normal	No. 95 was apparently a weakling; would not eat and died. The other two remained healthy throughout the trial.
4....	Rice meal, baked in cakes...	20·25	96 97 72	4·1 3·6 3·8	3·7 3·1	−0·9	11	Small, yolk almost white.	No. 72 was attacked and eaten by her mates, having become too weak to defend herself. Her bones very pliable. Numbers 96 and 97 improved after eating their mate.
5....	Rice meal, baked, and inorganic phosphorus.	38·75	24 25 12	3·5 3·8 4·3	3·4 3·5 4·3	−0·4	7	Small, yolks very pale.	Birds stayed in good condition throughout the trial.
6....	Polished rice, boiled.........	25·0	26 27 31	2·6 3·5 3·6	2·1 3·2 3·2	−1·2	1	Normal	Birds showed alternate periods of normal feeding and sickness. When feeding normally the droppings were very watery.
7....	Unpolished rice, boiled......	39·25	32 33 34	3·6 3·2 3·8	3·7 4·0 4·0	+1·1	0	....	Birds kept in good condition throughout, but the droppings were very watery.
8....	Cracked yellow corn, boiled..	27·25	35 36 37	4·5 4·9 3·7	3·8 4·5 3·7	−1·1	5	Very small but normal in colour.	Birds kept in fair condition, but droppings were watery.
9...	Yellow corn meal, baked....	39·25	38 298 39	3·2 3·1 3·4	3·1 2·5 3·7	−0·4	5	Normal in size and colour.	No. 298 showed weakness in legs and trembling after 41 days. She twice made a temporary recovery.
10....	Corn meal, baked, and phosphorus.	39·25	50 40 56	3·7 3·1 3·8	3·9 3·5 3·4	+0·5	7	Normal	Birds kept in good condition through the trial.
11....	Starvation, base ration .. .	11·87	214 41 41	4·4 4·0 3·5	4·0 2·8 2·5	−2·6	1	Normal......... ..	Birds were very hungry but were the most healthy and active of all the birds.
12....	Base........................	39·25	42 43 247	3·5 3·5 3·6	3·4 3·4 3·1	−0·7	18	Normal.......... ..	Birds in good condition all through trial.

AGASSIZ.

The inorganic phosphorus used in the above trials consisted of equal portions by weight of ground phosphate rock and basic slag. This was supplied in very small quantities. The above results are given simply to show the relative effect of the foods used on the health and condition of the fowls. From these results one sees that even the small amount of inorganic phosphorus helped to keep the birds in better condition when fed on rations normally low in this element.

Even in a ration of corn meal, which is not as deficient in phosphorus as some other feeds, there was a marked difference in the condition of the birds.

Another thing worthy of note is that when boiled rice or boiled corn was fed, they all seemed to have about the same laxative effect on the birds.

SHAPE AFFECTING WEIGHT OF EGGS.

A large number of eggs were measured and weighed in order to find out what effect the extreme dimensions had upon the weight. It was found that an increase in length or width above the normal was not always accompanied by an increase in weight. It appears that the degree of tapering either at one or both ends, has a greater influence on the comparative weight, than either of the extreme dimensions. It is important that all eggs so compared must be from the same day's laying, since there is an appreciable loss of weight after an egg is ten days old.

DUCKS.

Last season ducks were kept here for the first time. From a small lot that was hatched by hens during the summer, six ducks and one drake were kept, and one drake was obtained from the Central Experimental Farm at Ottawa. These ducks are of the Pekin breed.

The ducks were fed throughout the winter and breeding season on a mixture of:—

Bran, two parts by measure.
Corn meal, three parts by measure.
Shorts, one part by measure.
Crushed oats, one part by measure.
Pulped mangels, three parts by measure.

They had a small, shallow, cement pool to paddle in during the year, and were provided with a house, but they preferred to sleep outside during the entire winter.

On February 12 they commenced laying, and in the succeeding seventy-nine days laid 60·6 eggs apiece, making a total of 364 eggs.

Cost of Ducklings to Three Weeks of Age.

Total cost of food, 8 breeding ducks	$12 81	
Cost per duck	1 60	
Cost per doz. eggs	42·2c.	
Cost per egg	3·5c.	
Hatching 40 ducklings		$4 33
Cost of hatching one duckling	10·8c.	
Cost to rear 40 ducklings, 3 weeks		4 46
Cost to rear 1 duckling, 3 weeks	11·1c.	
Cost to hatch and rear 40 ducklings		$8 79
Cost to hatch and rear one duckling	21·9c.	

These results are taken from the early part of the breeding season. The work is still going on at the time of writing. Much more work will be done in this branch of poultry keeping in the coming year.

AGASSIZ.

SQUAB PIGEONS.

We have recently made a beginning with pure-bred extra large Homer pigeons for squab rearing. The object of this is to collect information concerning this branch of poultry keeping under our climatic conditions.

For this purpose we have erected a small, convenient pigeon house with a fly or coop attached to keep them confined. This confinement is to prevent the risk of carrying disease into the chicken yards.

EXPERIMENTAL STATION, INVERMERE, B.C.

REPORT OF THE SUPERINTENDENT, G. E. PARHAM.

POULTRY.

The year's report, in a new Station such as this, must largely consist of an account of the preparations which are being made for future work. Last year we moved on to a 17-acre poultry run lying to the west of the Experimental Station proper, and suffered severe set-backs because we had been unable to have the runs in a proper state of preparedness.

The location is an excellent one, well sheltered from the south winds; the land slopes quite steeply to Tobey creek, and as the land is a sandy loam with gravel sub-soil, there is excellent drainage, while the pine trees afford shade and shelter. The run is divided into four pens for poultry and two for turkeys. This year we have a building 22 feet by 20 feet ready for use, the upstairs providing a temporary dwelling for the poultryman, who will thus be able to give more constant attention to his charges. The basement is divided into incubator room, testing room and root cellar.

BREEDING STOCK.

Last year two varieties only were bred, one setting and one non-setting, viz.: Barred Rocks and White Leghorns. This season a second pen of Leghorns has been added. It is of the famous Barron laying strain, and they are exceptionally fine birds. There was also purchased a pen of Light Sussex; these are lately acquired imported stock and hardy last year's pullets. The Light Sussex make excellent table birds, and as the winter egg records show, have so far proved good winter layers.

BROODERS AND INCUBATORS.

The incubators and brooders used on the Station last year were of the Cyphers variety. The incubator, a 120-egg machine, gave excellent results. For this year's work a 200-egg Tamlin incubator and two Brett's Cabinet Adaptable hovers are being used as well.

BREEDING EGGS.

Eggs sold for hatching purposes were distributed to settlers during the breeding season, and very satisfactory returns were reported in every case heard from.

The chief losses suffered were from the depredations of crows, hawks and weasels, but this will be largely obviated during the present season by the presence on the spot of a resident poultryman, also from the fact that the underbrush has been cleared both in and adjacent to the runs, and a harbour for vermin thus destroyed.

The whole flock is in a healthy condition, and has been, through the whole season, particularly free from diseases.

HOUSING.

In housing the birds gave entirely satisfactory results. Two cotton-front houses as described in Poultry Circular No. 7, and two utility poultry houses, of which a description was given in last year's report on page 988 were built. These latter seemed specially suited to our local requirements, and have a special feature which should recommend them to the average farmer. The scratching shed is detachable and makes a satisfactory and convenient brooder house at a time when the scratching shed is not needed.

TURKEYS.

There was one pen of turkeys last year, one gobbler and three hens, and thirty-five chicks were hatched. There will be two breeding pens this season.

REPORT

FROM

THE TOBACCO DIVISION

For the Year Ending March 31, 1915

PREPARED BY

The Dominion Tobacco Husbandman. - - - - - - - - - - - - - F. Charlan.

Manager, Tobacco Station, St. Jacques, Que. - - - - - - - - - O. Chevalier, I.N.A.

Manager, Tobacco Station, Farnham, Que. - - - - - - - - - - O. Chevalier, I.N.A.

Manager, Tobacco Station, Harrow, Ont. - - - - - - - - - - - W. A. Barnet, B.S.A.

REPORT FROM THE TOBACCO DIVISION

The Director,
Dominion Experimental Farms,
Ottawa.

Ottawa, March 31, 1915.

Sir,—I have the honour to submit herewith the report of the Tobacco Division for the year 1914-15.

In addition to the report on the work at headquarters in Ottawa, and on the test plots of the Central Experimental Farm, there will be found herein reports from Mr. O. Chevalier, Chief of the Tobacco Station at Farnham, Que., from Mr. W. A. Barnet, Chief of the Tobacco Station at Harrow, Ont., and from Mr. G. C. Routt, Inspector for Ontario in 1914. Mr. Humbert, the Inspector for Quebec, being a French reservist, left for the front at the beginning of the war, in August, 1914. The report for the district of which he was in charge, as well as for the Station of St. Jacques l'Achigan, was compiled from his notes.

I have the honour to be, sir,
Your obedient servant,

F. CHARLAN,
Dominion Tobacco Husbandman.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

REPORT OF THE DOMINION TOBACCO HUSBANDMAN, F. CHARLAN.

The programme of this Division was summarized and explained in our previous report. The addition of two inspectors to our staff, enabled us this year to enlarge the scope of our work; one of these inspectors was put in charge of the province of Quebec, particularly of the north shore district, and the small tobacco Station of St. Jacques l'Achigan, the other one was put in charge of the province of Ontario.

These two agents were engaged at the beginning of the season. Mr. Paul Humbert, inspector for Quebec, belonged to the Tobacco Administration in France before coming to Canada, Mr. G. C. Routt, inspector for Ontario, belonged to the Experiment Station of Lexington, Ky.

Character of the season.—The season of 1914, although better than the previous one was not, however, very favourable to the growing of tobacco. As a general rule, periods of hot weather alternated with periods of drought, and almost during the entire season of growth, the tobacco plants suffered either from the cold weather—or rather the lack of heat, or from the drought. The drought was our worst enemy. With the exception of a few light showers, the rain came very late, only at the end of the season. In some cases the plants were fairly well developed, but in most places, for instance at Farnham and to a certain extent at Ottawa, some varieties did not reach a sufficient degree of maturity.

In Ontario the conditions were a little more favourable. However, the Burleys were, as a whole, harvested later than in a normal year. The Virginias would have yielded a much larger proportion of bright yellow leaves if the end of August and the beginning of September had been a little warmer.

In the Yamaska district, in spite of the difficulties under which transplanting was done and of the comparatively cold month of June, a satisfactory crop might have been harvested, had it not been for two hailstorms in August, which struck the crop when it was almost fully developed and destroyed a great number of tobacco fields.

Notes on some varieties.—Among the varieties grown at Ottawa, the pipe tobaccos and so-called Canadian tobaccos were more specially studied. We now have good types of Connecticut (Seed Leaf and Broad Leaf), very uniform. The size of the leaf is satisfactory, as well as the yield in weight. The earliness is medium. Our General Grant has not shown any variation for the last three years, the yield in weight is good and the product very popular on the market. The Belgian tobacco harvested in 1914 has not been appreciated by some manufacturers, as much as we thought it would be; the yield of this variety might easily be increased if it were planted at the same distances apart as the Comstock and, with a heavier crop, it could be sold for a lower price, the actual price being considered to be a little too high by purchasers. The small Havana and Tabac Rouge gave an unexpected yield in weight. These tobaccos, which may be considered as representing an almost pure variety, are of small size, they are very early and could be planted at the same distance apart as the Canelle (2 feet by 1 foot). Under such conditions, their yield would be such as to pay liberally for hand labour. They would be the varieties *par excellence* for the small farmers or for those who have large families.

But of all the varieties tried in 1914, the most interesting is the Maryland. It is much to be regretted that we were not able to secure seed of better origin, but the leaves such as have been obtained—with a bright colour, pleasant aroma and light taste—will easily find a market in Canada. It will be necessary, however, to make a selection for earliness even if a slight decrease in yield should result therefrom, as the date of harvesting (September 14), is rather late for the province of Quebec.

Selection.—Selection work has been practised specially at Ottawa and at the experimental stations of St. Jacques l'Achigan and Farnham. At Harrow, our object was to ascertain the comparative value of various strains of white Burley, some of which were imported in the spring of 1914. The results of this test were not very conclusive; some of the strains introduced in 1914 do not show remarkable uniformity; none, in any case, has shown any superiority over the strain of White Burley that has been grown at Harrow for the last four or five years and which is derived from a selection made at the experiment station of Lexington, Kentucky.

Previous selections of Comstock Spanish gave us, in 1914, a few interesting strains, the seeds of which were distributed in the winter of 1914-15 to be grown under field conditions. As to the Yamaska and Big Ohio x Sumatra, we were able, in 1914, to make a mass selection for the first time; the seed harvested will be used as soon as there is a sufficient demand for the tobacco of these varieties. The selection of small Canadian tobacco has enabled us to isolate two strains almost fixed, which will be submitted to the manufacturers, as soon as a sufficient crop for a manufacturing test has been obtained.

A number of crosses were done at Walkerville by Mr. G. C. Routt, with a view to secure varieties resistant to *Thielavia Basicola* and also early strains for the production of yellow tobaccos. A small number of crosses obtained at St. Jacques and Farnham included special cigar varieties.

Tests with chemical fertilizers.—Since the beginning of our work, owing to the insufficient quantity of farm yard manure available, chemical fertilizers have always been used as a supplement on tobacco land, with the exception of the Ottawa plot where farmyard manure is used exclusively.

In some localities of Ontario where tobacco is grown on a large scale, there are practically no cattle. The only manure available is horse manure which is produced in a very limited quantity and hog manure which is not recommended for the growing of tobacco. In Quebec, the dairy industry, which is flourishing in other parts of the province has not developed to the same extent in the tobacco growing districts.

Therefore the use of chemical fertilizers for the growing of tobacco, is almost a necessity in most parts of Canada. A systematic series of tests was undertaken in 1914 at Farnham and Harrow to ascertain the most economical formula, that is the mixture of chemical fertilizers which would enable one to obtain, not the highest yield, but the most profitable yield per acre. No definite conclusion can be drawn from a year's test but, as will be seen in the reports of Messrs. Chevalier and Barnet, the formulae that were adopted at the start, after a study of the requirements of the varieties of tobacco generally grown, may be recommended.

One cannot, however, lay too much stress upon the importance of avoiding any chlorine in potassic fertilizers, as well as the mixtures specially prepared for the growing of potatoes, and which generally contain kainite or some form of potassium chloride. Unless these precautions are taken, the tobaccos will be incombustible and almost useless.

Methods of harvesting.—The necessity of reducing to a minimum the losses on the field after the tobaccos have been cut and of reducing the proportion of sand which remains on the leaves after the latter have long been in contact with the soil has compelled us to use movable stands.

These movable stands are very easily built. The only requirements are the following: (1) A sufficient height from the soil to avoid any contact with the latter. (2) Proper spacing of the laths so that the plants will not be too close, or too far apart. (3) The crop should be placed on the stand the same day that it is cut. Thus, injuries from the dew are avoided. The tobaccos should also be covered with damp-proof covers, in order to be protected from the frost during the night and also, to a certain extent, from the rain.

The tobacco plants should not be left as long on the stands as they were at Harrow in 1914. From three to five days are sufficient, according to the weather and the time available.

The crop should be hauled to the curing-house as soon as it has sufficiently wilted and the yellowing is well advanced. The use of these stands, by which the crop may take its yellow colour upon the field without being exposed to serious injuries, gives more time for the various operations: suckering, hauling of wilted tobaccos, cutting, laying on the stands, etc.; a better use can be made of the hand labour and there is a considerable saving of money.

Curing.—At Harrow, Ontario, an experiment was made to ascertain if the curing of white Burley could be hastened, and the colour of the leaves improved at the time of cutting, by splitting the stalk, according to the method practised in Virginia, in Carolina and even sometimes in Kentucky. Owing to the lack of help at the proper time this part of the work had to be done somewhat too hurriedly and no definite conclusions could be reached.

Better success was obtained in Quebec where an experiment with charcoal heaters has enabled us to check the appearance of moulds during a long rainy season in the late fall, while hastening the complete reduction of the ribs, that is to say the end of the curing.

This experiment was even carried further. At the request of some manufacturers and tobacco dealers, arrangements were made to cure a crop of Comstock Spanish by the flue curing process.

The result of this experiment was not entirely satisfactory. But, if due allowance is made for the condition of the crop (it was harvested during a cold and rainy period), and considering the proportion of bright leaves obtained, it may be hoped that this process will give better results next year, when it is applied to mature tobacco with better texture (Virginias or perhaps General Grant or Connecticuts). The texture of the Comstock Spanish is much too fine for this process of curing.

Betuning.—A lot of broken leaves and leaves for fillers, from the 1913 crop, were submitted to this treatment. The formula used was supplied by the agent in charge of the St. Césaire warehouse, and applied under his direction. The results were most satisfactory. The products kept very well, no moulds were observed and even some parts of the leaves which were beginning to show signs of moulds became quite sound. When the bulks were taken down the tobacco gave off a pleasant smell, with a strict ammoniacal odour.

It is not known whether the tobacco treated with this formula would be liked by all manufacturers. In any case, considering the present condition of the market for Canadian tobacco, it seems that a great deal could be done in this direction.

Fermenting.—The grading and fermenting of our 1914 crop at St. Jacques and Farnham, were done at Farnham, in the warehouse of the J. M. Fortier Co., Ltd. This decision was taken for several reasons; the Ottawa warehouse was overfilled; it was desired to finish this work as quickly as possible so that the rest of the winter might be available for the distribution of seed, for the laboratory work and the pre-

paration of our programme for 1915. Lastly, it was desired to have the products packed by an expert who is familiar with the needs of Canadian manufacturers, so that we might know exactly what grading is required by the latter.

The work was quickly done; it was finished at the end of December, thanks to the use of numerous help, and the products were fermented in boxes. The results would have been more interesting if it had not been necessary to discard a large part of the crop on account of injuries caused by hail in 1914; it was the part which would have supplied the largest proportion of fillers of first quality.

Inspection work.—This work was started on a small scale in the spring of 1914 with a view to ascertain, as fully as possible, the needs of the farmers whom it is our duty to help, their resources in land and material, and to discuss their problems and difficulties with them on the spot.

Our inspectors travelled chiefly in districts comparatively remote from our experimental stations, the districts around these stations being attended to by the superintendents. They were able, this year, to give us information on the condition of the seedlings, the preparation of the soil and, to a certain extent, on the areas planted in tobacco as well as on the condition of the crop and the process of the curing. They also made a summary examination of the types of soils met with in their districts. This work has already furnished interesting results which may be made use of as soon as tobacco growers have learnt that different soils require different varieties; that a variety which does well on a part of their farm may not be the best for another part where the soil is different. This choice of varieties according to the nature of the soils has a great influence over the quality of the products.

The report of Mr. G. C. Routt gives an idea of the work done. It contains a candid comparison between the Ontario and the Kentucky Burleys. This comparison, without belittling the advantages of the Canadian product, show to what extent improvements can be made.

One of the best results of this inspection work in Ontario is that the future of tobacco growing in comparatively new centres can now be ascertained. Tobacco growing in Canada, and especially in Ontario, is still in the embryo stage and can be greatly developed.

Unfortunately, the work of the Quebec inspector came to an end when he left for the front in August, 1914. Owing to the great variety of the soils in the part of Quebec where tobacco is grown, and the comparatively large number of varieties used in a small area, this work is perhaps more useful in Quebec than in Ontario, where, although the variation of soils is about the same, the number of strains grown is not so large. It is hoped that this most important work can soon be resumed and developed.

Our Quebec inspector, Mr. Humbert, was killed in action on the 8th January, 1915. The loss of this energetic, enthusiastic and highly competent officer is deeply regretted. How well he understood his duties, and how intelligently he was preparing to carry them out is clearly shown by the summary notes which he handed in before leaving for the front.

Control of diseases.—An experiment on the acidification of diseased soils, as a means of control against the root rot, *Thielavia Basicola*, was undertaken at Walkerville, Ontario, with the co-operation of Walker & Sons. The results obtained in 1914, which are stated further on by Mr. Routt, do not enable us to conclude in favour of this treatment, which, however, is recommended by specialists who have been experimenting on *Thielavia Basicola*. The experiment will be resumed in 1915 and an endeavour will be made to reduce to a minimum the risks of error and to follow as closely as possible the methods of application recommended.

Increase of the tobacco industry in Canada.—By this heading is meant the increase in the use of Canadian tobacco for manufacturing purposes, rather than the increase in the area actually planted.

As regards leaves for binders, there is an ever-growing demand for the Quebec Comstock Spanish and a fairly active demand for yellow, somewhat dry leaves which, unfortunately, were produced in rather large quantity in the Quebec northern district in 1914 and which sell at a fair price. The price of the Ontario Burleys has been cut down a little during the winters of 1913-14 and 1914-15, the purchasers claiming that the quality of the 1914 crop was not sufficient to justify them in accumulating large stocks, but on the other hand there has been a very strong demand for the flue-cured tobacco of the Virginia types, the growing of which is rapidly developing in southern Ontario as the production is not nearly equal to the demand.

If this yellow tobacco industry may be established in Southern Ontario, the growing of the White Burley may easily be transferred to the southeastern part of Ontario, the north shore of Lake Ontario and a part of the district between Toronto and Ottawa. Thus the area in tobacco could be increased in Ontario without any danger of over-production.

Another industry is making rapid progress; the manufacture of cigars entirely made of Canadian tobacco. It is limited to the manufacture of cheap cigars of the "stogies" type, and little cigars. Nevertheless, owing to the popularity of these products and the enormous sale of the same, this industry consumes important and ever increasing quantities of Canadian tobacco.

At the present time, a demand which it would be urgent to satisfy is the demand for "fillers." It is hoped that this problem will soon be solved, at least to a certain extent, by means of strains imported from Ohio and Pennsylvania, one of which at least has shown itself well adapted to the climatic conditions of Quebec and Eastern Ontario.

Publications.—Bulletin No. 21, 2nd series, Experimental Farms, entitled "Seedlings of Tobacco," was published during the year. It is an exhaustive study, in simple language, of the problems connected with the production of tobacco seedlings.

EXPERIMENTAL WORK AT OTTAWA.

The number of varieties or rather of strains of tobacco grown on the test plots of the Central Experimental Farm, has been considerably increased, owing to the necessity of developing the selection work started in 1913.

These varieties are the following:— 9 Comstock Spanish, 1 Yamaska, 1 Tabac Rouge, 1 Big Ohio x Sumatra, 2 Big Havana, 1 Big Ohio, 1 General Grant, 1 Connecticut Seed Leaf, 1 Connecticut Broad Leaf, 2 Brazils, 2 Canelles, 3 small Havanas, 1 Parfum d'Italie, 2 Tabacs Rouges, 1 Feuille d'Or, 1 Rose de Perse, 1 Maryland, 5 Virginia x Herzegovina x Virginia, 2 Giant Herzegovinas, 4 Virginia x Herzegovina, 5 Herzegovina Stolak.

Among these varieties the Small Havana, Parfum d'Italie, Tabac Rouge, Feuille d'Or, Rose de Perse, Maryland, were grown at the Experimental Farm for the first time; the seed had been purchased from seedsmen. The germination in the beds was very poor, almost a failure in some cases. The growth on the field was normal, but the large number of strains observed in some varieties show conclusively that the seedsmen pay very little attention to the question of purity. On the other hand this seed, which is often of doubtful origin, is kept too long in the stores, sometimes under bad conditions, and it loses rapidly a part of its germinative power.

The price of the seed of some varieties is so high that it is reasonable to expect some guarantee from the seedsmen. Unfortunately, the lists published by the latter do not specify all the conditions of guarantee; these conditions are printed on the packages of seed and the farmer is aware of this only when he receives these packages, which is always too late when the order is given by mail.

SOWING.

The sowing was done on a hotbed, two semi-hotbeds and the corner of a heated greenhouse. The hot and semi-hotbeds were made after the usual fashion, the first on a bed of fermenting horse manure, the second on a bed of tobacco stalks. One half of the hotbed and one half of the semi-hotbed received an application of chemical fertilizer 3-8-3 at the usual rate of 1 ounce per square foot, the other semi-hotbed and the other half of the hotbed did not receive any chemical fertilizer.

In the greenhouse the bed consisted of a layer of good vegetable earth, about five inches thick, placed on a stand of boards which had been perforated to insure good drainage.

The hot and semi-hotbeds were seeded with dry seed on April 24 and 25, and the greenhouse bed on the 28th. In the beds, the seedlings made an appearance on the 29th of April; in the greenhouse, on the 6th of May.

A rather large quantity of efflorescence was seen on a part of the hotbed which had been treated with chemical fertilizers as well as on the semi-hotbed submitted to the same treatment. This disappeared rapidly when sprinkling was done. This accident, which was not very serious, might have been avoided if a thicker layer of vegetable earth had been used, one inch instead of half an inch.

The following notes were taken:—

April 29.—Large number of seeds germinated on the surface of the soil, under the glazed sashes.

Some efflorescence on the part of a hotbed which had been treated with chemical fertilizers and on the first semi-hotbed.

Water drips in the greenhouse, causing an excess of moisture and a marked cooling of the temperature.

Cloudy and rather cold weather. Temperature keeps about 60° F.

May 8.—The stand is good in the hotbed on the parts which have not received chemical fertilizers, thin on the parts which have been fertilized. On the first semi-hotbed, the stand is sufficiently fairly well distributed but the seedlings are slightly burnt on the parts where effloresence has appeared.

The second semi-hotbed is very good, the stand even. There is a lack of seedlings towards the lower part of the beds, which is damper and where the light is not so good.

In the greenhouse the seedlings are very late. Ventilation insufficient.

The seeds of the Tobacco Division have germinated well, the seeds supplied by the seedsmen have a very uneven germination; some have not germinated at all.

May 19.—The stand is good on all hotbeds where no chemical fertilizers have been used; there are a number of misses and the seedlings are later in the three beds where chemical fertilizers have been used than on the others.

In the semi-hotbed treated with chemical fertilizers the stand is fair; there are a number of misses. However, on the whole, the number of seedlings is sufficient. The untreated semi-hotbed is very good, not so far advanced, however, as the good parts of the hotbed. The Italian tobaccos are by far the earliest.

The greenhouse is very late. Some tradesmen's seeds have not germinated at all.

The greater part of the seedlings under the sashes could, under good treatment, be utilized in eight or ten days.

May 29.—(Final comparison between the various beds.)

Between the first semi-hotbed and the best part of the hotbed, the advantage, considering the development of the seedlings, lies with the hotbed. The vegetation on the semi-hotbed has evidently suffered from the chemical fertilizer being left too close to the surface.

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The second semi-hotbed is much better than the first one. Judging only by the growth of the seedlings, the good part of the hotbed has the advantage over the second semi-hotbed. Of the treated parts of the hotbed and the first semi-hotbed, also treated, the latter is by far superior. The combined effect of chemical fertilizer and of the heat of the hotbed seems to have had an injurious effect.

There is no comparison possible between sowing under glass and sowing in the greenhouse, as greenhouse seedlings are very late.

The following table contains a record of temperatures, maxima and minima, for the year 1914, as well as a record of outside temperatures.

TEMPERATURES of Tobacco Beds at the Experimental Farm, Season 1914.

	Hotbed.		Cold beds without manure.				Heated Greenhouses.		Outside temperature.	
	A Manure 8″		B Chemical fertilizer.		C No chemical fertilizer.					
1914.	Max. °	Min. °	Max. °	Min. °	Max. °	Min. °	Max. °	Min. °	Max. °	Min. °
April 25........	80	....	76	....	....	....	....	....	....	....
" 26........	69	55	64	54	....	....	....	....	....	....
" 27........	78	64	82	63	83	....	81	....	....	....
" 28........	92	72	90	71	91	68	81	60	....	....
" 29........	58	52	62	50	60	50	60	51	44	....
" 30........	90	50	90	50	90	50	82	43	85	38
May 1........	85	50	82	52	82	52	75	42	80	28
" 2........	75	55	72	50	72	50	80	42	75	28
" 3........	82	55	84	54	83	54	95	47	85	34
" 4........	80	58	80	47	80	54	87	54	78	43
" 5........	79	63	86	61	83	60	94	57	85	51
" 6........	83	59	85	57	83	53	85	53	90	43
" 7........	76	62	78	60	76	59	86	54	77	47
" 8........	83	56	80	52	83	50	85	47	86	40
" 9........	85	57	85	52	86	51	90	50	80	45
" 10........	80	57	78	55	75	57	85	50	80	46
" 11........	78	55	78	50	70	50	89	42	68	35
" 12........	82	57	79	60	80	60	84	50	67	48
" 13........	85	50	87	46	87	44	85	44	70	30
" 14........	82	54	80	51	79	46	80	54	70	35
" 15........	76	55	79	50	75	50	85	43	67	31
" 16........	82	54	83	49	78	48	82	46	72	38
" 17........	83	56	82	52	87	50	85	45	85	39
" 18........	84	59	82	53	85	53	84	51	89	48
" 19........	89	61	89	57	90	56	91	59	89	58
" 20........	88	62	88	58	92	57	86	58	89	47
" 21........	94	66	94	62	95	62	92	58	93	58
" 22........	93	70	93	68	96	65	89	61	95	53
" 23........	80	63	80	60	79	60	74	52	70	49
" 24........	90	55	91	54	92	52	89	45	79	37
" 25........	90	58	91	54	92	52	89	47	80	38
" 26........	92	70	95	68	96	67	92	54	93	70
" 27........	95	63	96	62	97	62	98	62	93	58
" 28........	100	66	99	65	102	62	85	58	80	57
" 29........	98	50	98	48	100	49	91	54	80	48
" 30........	90	60	92	60	91	61	90	48	85	47
" 31........	91	60	91	58	92	58	87	53	91	47
June 1........	93	59	94	55	94	54	87	63	90	48
" 2........	80	50	80	52	85	46	75	40	73	38
" 3........	76	49	76	51	76	52	74	53	73	48
" 4........	82	59	83	55	84	54	75	53	72	47
" 5........	....	50	....	49	....	49	....	45	....	44

To sum up: The best bed is the semi-hotbed with or without chemical fertilizers, according to the fertility of the vegetable earth that is used. As the vegetable earth used at the Experimental Farm is very rich the chemical fertilizers could have been dispensed with.

The efflorescence that appeared in the spring 1914 on the beds where the thickness of the vegetable earth for seedlings was not over half an inch had been avoided during previous years when one inch thick of vegetable matter had been used.

Complete details on these observations which have lasted several years will be found in bulletin 21, "Tobacco Seedlings," which is now ready for distribution.

TRANSPLANTING.

The work of transplanting was started on May 28, in exceptionally hot weather for the season. The growth of the seedlings on the beds was accelerated to such an extraordinary degree that it became necessary to pull them out before the day which had been appointed for transplanting. Unfortunately, this period of hot weather was accompanied by a long drought which made it very difficult to prepare the soil. For the first time since tobacco has been grown at the Experimental Farm, it was necessary to use water to insure the recovery of the seedlings.

It should be noted that on account of the comparatively small size of our experimental field and of the large number of varieties which are grown, machine planting, by which the seedlings are watered as they are put into ground, could not be used. Therefore the young plants had great difficulty in taking root and, on the other hand, the cutworms having done considerable injury, some parts of the field had to be replanted almost entirely several times. The situation was somewhat improved by a light rain on the 8th of June, but watering had to be continued on the other resettings.

The season of 1914 was unfavourable. The seedlings, suffering from the drought and the extreme heat of the end of May, did not take root very well. To make matters worse, the temperature was comparatively cool during the summer. There was only a short period of heat with the exception of the end of May and the beginning of June, when the hot weather gave us so much trouble at transplanting time.

Owing to the comparative coolness of the summer, our seeds ripened much later than in a normal year. However, the plants which had been topped were ready in good time, even a little earlier than usual for the seed leaves. Most of the latter were ready to be cut during the second fortnight of August, some as early as the 18th.

Among other varieties grown, some were not harvested until a comparatively late date in September, chiefly because it was desired to let the tobacco yellow up on the field before it was taken to the curing house. This was particularly the case for the Italian Virginias, Maryland, Feuille d'Or, etc., which were very ripe when harvested.

As in previous years, the seed plants were protected from the frost by being pulled out towards the middle of September and placed under a canvas covering during the night.

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The following table shows the distances apart at which the varieties grown in 1913 were planted, the date of harvesting, the yields in weight, in raw tobacco per acre and per arpent. The yields are computed for a plantation without any misses. They are possible yields. It should be noted, however, that they are computed from rather weakly plants which, with very few exceptions, had not been considered good enough for the production of seeds.

Distances apart.	Number of plants per acre.	Varieties grown.	Date of harvesting.	Yield in Weight. Per acre.	Yield in Weight. Per arpent.
Feet.				Lb.	Lb.
3 x 2½	5808	Big Ohio	Sept. 14.	2349	1984
3 x 2	7260	Big Havana, No. 130	" 14..	2032	1717
		" " 138	" 14..	2970	2509
		General Grant	" 5..	2002	1691
		Connecticut Seed Leaf	August 25..	1452	1226
		" Broad Leaf	" 25..	1744	1473
		Virginia x Herzég. x Virg. No. 52	Sept, 14..	2074	1752
		" " " " 55	" 13..	1893	1599
		" " " " 57	" 13..	2292	1936
		" " " " 54	" 4..	1452	1226
		" " " Scafati	" 4..	1954	1651
		Herzégovine Giant, No. 30	" 8..	1879	1587
		" " Scafati	" 9..	2209	1866
		Virginia x Herzégovine, No. 35	" 13.:	2178	1840
		" " " 37	" 14..	2904	2453
		" " " 39	" 4..	1675	1415
		" " " Scafati	" 4..	1452	1226
		Herzégovine Stolak, No. 12	" 13.	1815	1533
		" " " 20	" 13..	1053	889
		" " " 21	" 4..	1599	1351
		" " " 23	" 4..	1428	1206
		" " Scafati	" 4..	1361	1150
3 x 1½	9680	Big Ohio x Sumatra	August 25..	1627	1374
		Belgian	" 17..	1631	1378
2½ x 1½	11615	Comstock Spanish, No. 109	" 17..	1802	1522
		" " " 114	" 19..	1786	1509
		" " " 118	" 19 .	1985	1677
		" " " 108	" 19.	1633	1379
		" " " 106	" 19..	1250	1056
		" " St. Jacques, 1909	" 19..	2217	1873
		Comstock Spanish " 1909	" 19.	2356	1990
		" " 1909	" 19..	2009	1697
		" St. Césaire, 1909	" 19..	1818	1536
		" No. 119	" 19..	2165	1829
		" " 104	" 19..	1890	1597
2½ x 1½	....	Yamaska	" 19..	1567	1324
		Brazilian, St. Félix	Sept. 1..	1410	1191
		" Las Almas	" 1..	1441	1217
		Maryland	" 14..	2419	2044
		Golden Seal	....	1896	1602
		Small Havana, Mir	....	1032	872
		" Bl	....	1161	981
		Tabac Rouge, Ferg	August 25.	1346	1137
		Small Havana, "	" 27..	1548	1308
		Tabac Rouge, Lev.	" 27..	2007	1695
2 x 1	21780	Canelle P	" 18..	1601	1352
		" R	" 18..	1281	1082

NOTE.—For computing the yield per acre, the area of the arpent was figured at 0·845 acre.

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NOTES ON THE VARIETIES.

As a whole, the yields in weight are much higher than the yields obtained in 1913.

It will not be necessary to repeat what has been said in last year's report about the varieties Big Ohio, Big Havana, General Grant, Connecticut Seed Leaf or Broad Leaf. These varieties give good results on light soils, well manured and well drained, where no very early frosts are to be feared. Of course, the Connecticut was harvested at an exceptionally early date in 1914; in a normal year, this variety could hardly be harvested before the beginning of September. Of the two Connecticuts tried in 1914, the Connecticut Broad Leaf seems to be a little earlier; both were cut on the same day, the 25th of August, but the latter was much more advanced in ripening.

Belgian Tobacco.—This tobacco, of an indefinite variety, probably a degenerated Obourg type, gives a good yield in weight and ripens fairly early. It is almost as early as the Comstock. It could be recommended to the growers not having suitable soil for the production of thin tobacco—Comstock—and who, living in a locality where early frosts are expected, cannot grow the Connecticuts.

It is a pipe tobacco of average strength which is fairly well liked in Canada.

The seed used in 1914 gave numerous strains, from the large leaf of the Connecticut Broad Leaf to the long and curled leaf of some Kentuckys, as the One Sucker. The most interesting types were selected and will be grown in 1915 for the production of seed.

Comstock Spanish.—The Comstock Spanish is by far the earliest of all our industrial tobaccos. It is one, which, apparently, may be depended on in all seasons. The yields in weight were good. The variations in yield were a little more marked than might have been expected, however; those noted on this table are more the result of the differences in the nature of the soil of our experimental field than of the characters which it was endeavoured to fix during the previous selections. In all cases, the lots originating from seed selected during the previous year showed the greatest uniformity in the shape, the colour and the texture of the leaves, the earliness and the vigour of the plants. It shows that this work of selection may be continued with good results and that by taking averages even on those test plots, which differ so much in composition, the strains originally selected may be distinguished with sufficient accuracy and their relative value may be ascertained definitely.

Brazilians.—Brazilians have done little better than in 1913. However the products of this variety can only be used as fillers. They are thick, without much elasticity and have not a very pleasant taste. Although the seeds we had came from two of the best species, Las Almas and San Felix, the results obtained are not very satisfactory.

Big Ohio x Sumatra-Yamaska.—These hybrids are almost fixed, and it is probable that they may be handed to some farmers in 1916. The Yamaska has retained all the earliness of the Comstock, the leaf is a little smaller, a little more rounded in shape, the ribs are finer, a little more elastic. It is expected that the products may be used for binders and perhaps they may sell for a higher price than the price which has been paid so far for Comstock Spanish.

The Big Ohio x Sumatra has not been quite so early, however, it was cut before the end of August. The yield in weight of the latter strain is not much greater than that of the Yamaska, although the plant looks far bigger. In this case also, one must consider the nature of the part of the experimental field where this tobacco was grown.

An endeavour is made to establish a strain of Big Ohio x Sumatra with a leaf of average length, of good width (about 3 to 5), elastic and of light green colour. Up to the present, the proportion of leaves with a dry point has been too large; at the base these leaves show the characteristics of the Sumatra and at the point, the characteristics of the Big Ohio, much too marked.

OTTAWA.

Maryland.—This variety gives a most striking instance of the risk that one takes in purchasing seed from the seedsmen. The good faith of the seedsmen is not in doubt, as it is quite probable that the original seed was true, but it was a great mixture. It had all the colours of the rainbow, from the light yellow to the dark green.

A selection was made of the best plants, as far as shape and colour are concerned; the object being to secure early tobacco, of a light colour. Some good plants were selected.

Since that time a better seed was received from some of the best districts and through reliable agents. It will thus be possible to make the necessary comparison.

The Marylands, although not quite so early as the Connecticuts, can be grown in Canada. They were harvested on the 14th of September but it is probable that in the neighbourhood of Ottawa and in the district west of Ottawa, it is almost as safe to grow them as the great Seed Leafs. They yield a little more than the latter and if light coloured leaves can be obtained, as required by the market, they may sell at a higher price than the latter.

Feuille d'Or—(Probably Gold Seal).—Many requests for seed of this variety had been received. It is a tall plant with large lanceolated leaves fairly close to the stem. It is medium in yield and earliness. It cures fairly easily, although the stem is rather big, and gives a light red leaf, a little darker than the best Maryland strains and with a looser texture. If the Maryland can be used for cigarette tobacco, the Feuille d'Or, such as we have harvested, would be suitable only for the manufacture of pipe tobacco or perhaps for plug wrappers.

Small Havanas—Red Tobaccos.—Seed from five different places was tried. Four times that number should have been tried in order to get an idea of what is understood in Canada under those rather loose titles, but there was not sufficient space.

Two of these seeds marked "Tabac Rouge" and "Petit Havane" have almost surely the same origin: tall plant, pronounced Cuban type, green leaf, with a Cuban shape but thick and lacking in elasticity. The name "little Havana" is hardly justified for a plant which is six feet and over; it is not a "tabac rouge" either. If the leaf had been a little finer and more elastic, it might have been used as cigar fillers. A selection was made with that object in view. The yield in weight is satisfactory, the earliness is sufficient and the leaves cure without difficulty.

Only one lot of the seeds grown under the name of little Havana gave a really uniform product. Small plant with a smaller number of leaves, well spaced on the stem, with an oval, rounded shape, a little larger than the Canelle. Early maturity, rapid curing. The leaf easily takes a special red brick colour when well advanced in ripening.

None of the Tabacs Rouges treated in 1914 gave a purple or red flower. In one of the cases, it was only an accidental cross of Comstock Spanish and Little Havana, perhaps also of Cuban.

Too much time has perhaps been spent on the description of these varieties. However, it is felt that the attention of Canadian growers should be called to the fact that it is absolutely necessary to keep up the purity of the strains that have made the reputation of some centres of the province of Quebec. These strains are the Canelle, Small Havana, Tabac Rouge, Petit Canadien, etc.

As to the Canelle, it is believed that seed of pure Canelle or almost pure Canelle can still be secured, although some tobacco dealers complain of the difficulty that they have to find Canelle as good as those of the old time. As to the other varieties, only one result about satisfactory has been obtained so far. In most cases they are hybrids of indifferent quality, without any uniformity, varying from the Havana Seed Leaf or Comstock Spanish, as the case may be, to the Cuban more or less pure, all products of chance crosses.

OTTAWA.

Virginia x Herzegovina, Herzegovina Stolak, etc.—It was specially desired to note the result of individual selections made in 1913, and to secure seed. Owing to the uniformity of the various lots originating from the seed harvested in 1913, it was decided to grow, in 1915, on a more extensive area, two selections of Virginia x Herzegovina which would thus be submitted to a practical growing and curing test.

FERMENTATION AT THE WAREHOUSE.

The tobaccos from the 1913 crop on the stations of St. Jacques l'Achigan and Farnham were fermented in 1913-14 by the system of bulk fermentation.

The first fermentation was well carried out, but at the second mould was observed, the proportion of humidity in the rooms had to be reduced and the blankets had to be taken off from the bulks of tobacco.

This removal of the blankets was apparently sufficient to prevent the condensation of humidity which produces, near the edges of the bulks, a favourable zone for the growth of mould. While the moulds were destroyed in the centre of the heaps by the temperature of the latter, they could no longer find, along the edges of the heaps, the favourable conditions for their growth.

By courtesy of the Dominion Botanist, Mr. H. T. Güssow, a study of the moulds of tobacco was started on the spot by one of his assistants. Unfortunately, however, this work came to an end when this assistant rejoined the French Army.

Betuning.—An experiment on betuning started in the summer of 1914 gave fairly good results. In spite of the rather high proportion of humidity to which they were submitted before being bulked up to be fermented again, the leaves came out of the bulks perfectly sound, markedly improved and with a strictly ammoniacal odour. They were packed in the middle of the summer. However, the temperature did not rise enough to provoke a new fermentation in the final packages.

Grading.—The tobaccos from the 1914 crop were packed at Farnham. A preliminary grading was done on the farm when the leaves were being stemmed. Three classes were made; top, median and bottom leaves and trash. However, on account of the damage caused by the hail on August 19, too many broken leaves were included with the bottom leaves and the value of the latter was reduced in proportion. Owing to this fact, there was no final grading, as the cost of this work would have been out of all proportion with the real value of the products.

The warehouse of Mr. J. M. Fortier, Limited, was placed at our disposal and the grading and packing were done under the direction of the foreman of the St. Césaire Co-Operative Society. Our tobacco therefore was prepared in much the same manner as the products of the St. Césaire district have been prepared for the Canadian market during the last few years.

Abundant help being available, this work was concluded in about a week. At the Central Experimental Farm, owing to the lack of space and of expert help, it would have required at least two months. The workmen were paid by the job and the expenditure was only half of what it would have been otherwise.

This tobacco, packed in boxes, was shipped to Ottawa in the middle of January. It was slightly fermented in our warehouse, at a temperature of 70 to 75 degrees, in an atmosphere which contained about 70 per cent of moisture (to prevent the appearance of mould).

The fires were extinguished at about the end of March and the tobacco was left at the temperature of the rooms. Since then the moisture averaged about 80 to 85 per cent. The observations made while the tobacco of 1914 was being graded are given in the report of the Manager of Farnham Station. It was desired to compare these results with the results of the 1913 crop, but owing to the number of injuries caused by hail, this comparison is impossible.

OTTAWA.

DISTRIBUTION OF SEED.

This year, as usual a large number of requests for samples of seed were received by the Tobacco Division but some of these could not be complied with owing to the rapid exhaustion of our stocks.

The number of samples distributed was as follows:—

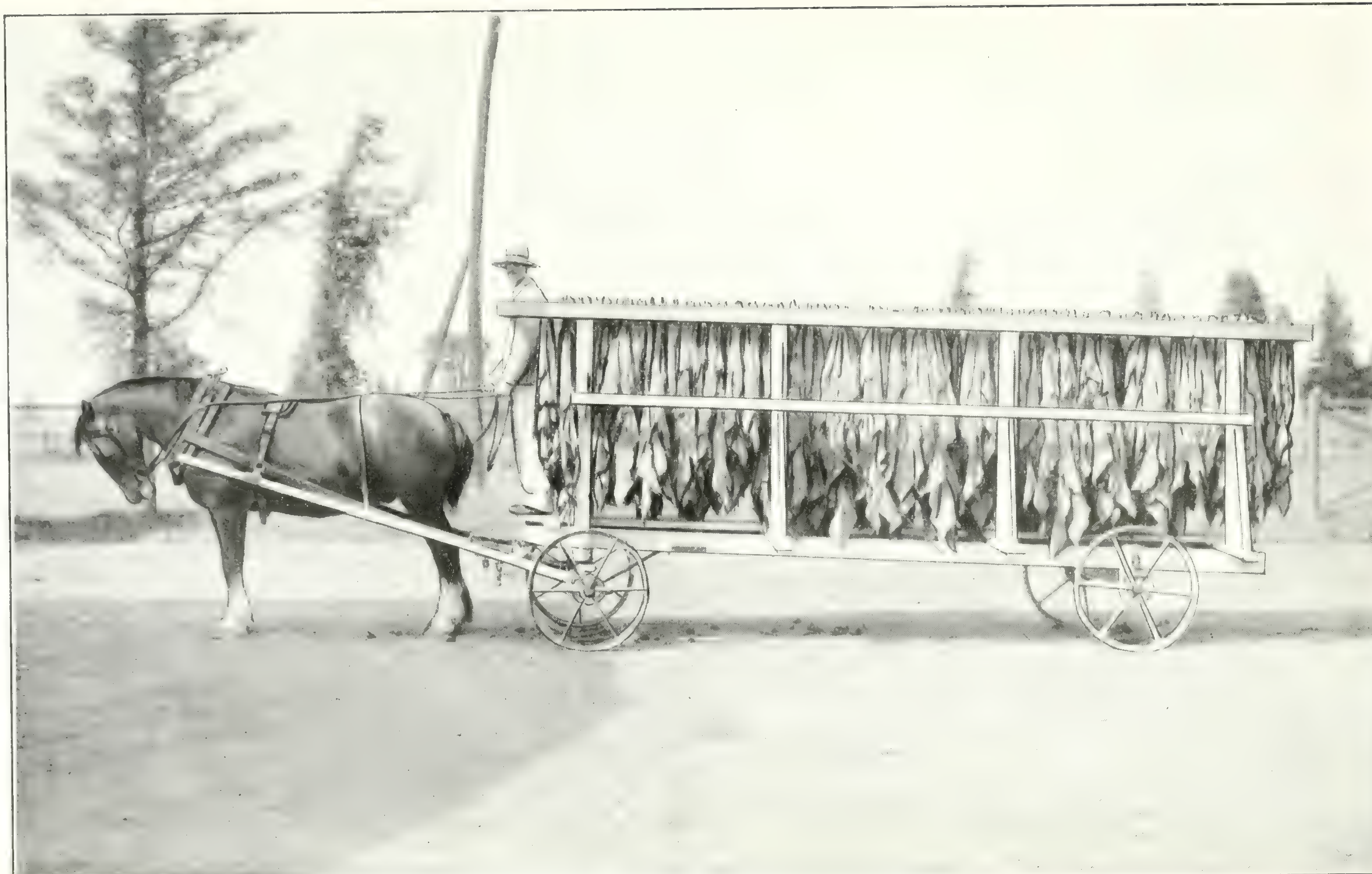
Canelle	1,387	Tabac Rouge	56
Comstock Spanish	1,305	Blue Pryor	38
Connecticut Seed Leaf	413	Warne	11
Connecticut Broad Leaf	328	Belge	2
General Grant	307	Big Ohio	5
Big Havana	144	Big Ohio x Sumatra	1
Petit Havane	136	Aurora	1
White Burley	90	Verel	1
Cubain	57	Comstock x Sumatra	1

A marked increase was noted in the number of demands for General Grant, Connecticut Seed Leaf, Connecticut Broad Leaf and Big Havana. These demands came specially from the districts along the north shore of the St. Lawrence, where pipe tobacco is gradually taking the place of Comstocks.

It is hoped that the comparatively early varieties of large tobacco which have been introduced at the Experimental Farm during the last few years will maintain their earliness in the colder districts where they were distributed and will escape the first autumn frosts which are the most serious obstacle to their establishment in those parts of Canada.

OTTAWA.

The Charcoal Heater. The best and cheapest means of combating excess of moisture in the curing-shed.



Special Wagon for hauling the Tobacco to the Curing-shed. A strong horse can draw 75 loaded laths (about 500 plants).

EXPERIMENTAL TOBACCO STATION, FARNHAM, QUE.

REPORT OF THE MANAGER, O. CHEVALIER, I.N.A.

It may be said that the Experimental Station of Farnham is farmed after an intensive method of cropping, the main crop being tobacco. A three-years' rotation is followed with tobacco as a leader; this rotation had been definitely adopted after five years of observations and practical experiments. It will be remembered that this place was at first in a very poor condition, owing to an unscientific and careless method of cultivation. Therefore it was necessary, apart from the growing of tobacco and other crops such as oats and clover, to renovate and repair the farm (drainage, buildings, leveling, ditches, clearing, etc.) In short the work of improvement kept us very busy. The first part of this report deals with the farm proper and the second with the improvements made.

THE FARM PROPER.

Tobacco being our main crop, it will have first place in this report.

Varieties.—In 1914 the following varieties were experimented with:—

1. Big Ohio x Sumatra (with a view to continue the selection of the strain originated by us five years ago).
2. Yamaska (same object as for preceding variety).
3. Havana Seed Leaf.
4. Comstock Spanish.
5. Cuban.
6. San Felix.
7. Las Almas.

The latter two are Brazilian varieties which it was desired to test for the second time, to ascertain if they would be suitable for the production of fillers.

There were also other varieties of more or less fixed type, generally pipe tobaccos, the advantages of which it was proposed to ascertain. These varieties are the following:—

Big Havana.
Obourg.
Tabac Rouge.
Big Ohio.
Small Havana
Small Havana (Mir.).
Feuille d'Or.
Connecticut Seed Leaf.
Maryland.
Small Havana (Bl.).
Persian Rose.
Sumatra.

The seeds of the latter varieties had been supplied by seedsmen or by some obliging farmers. The seed beds of the Persian Rose and of the Feuille d'Or were a complete failure. There were practically no seedlings. As to the rest, the crop was entirely destroyed by the frost of the 8th of October.

This frost caused a further delay of one year, as several good hybrids had been grown with success.

First, the hybrid Big Ohio x Sumatra, in which each one of these two varieties had been used, once as a male, once as a female. It was desired to reconstitute this hybrid. Out of 48 hybrid flowers, 42 heads formed and were making good progress towards ripening. The same had been done with the Comstock and Sumatra, but only

18 heads had formed out of 30 hybrids. The hybrids of the Connecticut Seed Leaf and of the Cuban had been a complete success; 37 heads were obtained on the 37 flowers artificially fertilized.

For two successive years the crop of our seed plants was destroyed by frost. As a prevention, it was decided to build on the farm a sort of greenhouse in which the seed plants would be taken and where they would be sheltered from the frost and could thus ripen without injury.

BEDS.

The coldbeds were used. The frames were placed in a well situated part of the farm, well drained, fairly high, and well sheltered on one side by the big curing barn and on the other side by a board fence, six feet high. The soil used came from a young clover meadow and it was disinfected by formalin before it was put into the frames. Half the beds received an application of chemical fertilizers, according to the usual method, and the other half did not. No difference was observed between the two lots of beds, treated and untreated, when the seedlings were growing. When ready, the frames were exposed to the sun during four days, when the surface was lightly raked and sowing was done as follows:—

April 22: Comstock Spanish, Havana Seed Leaf, Big Ohio x Sumatra, Yamaska. (Nine beds and a half.)

April 23: Las Almas, San Felix, Cuban, and other varieties previously mentioned. (Ten beds and a half.) A total of twenty beds of 15 by 5 feet, or a total area sown of 1,500 square feet. All the seed was sown at the rate of one-seventh of an ounce per hundred square feet of bed.

White canvas was laid on the sashes to prevent sunburn and nocturnal radiation. At the beginning, the beds were watered about noon with lukewarm water (25° centigrade). Later they were watered twice a day according to the condition of the seedlings. The day after the sowing was done, the beds were ventilated more or less according to the outside temperature. The temperature of the beds and the outside temperature were fairly closely recorded. Further on in this report, diagrams will be found showing a record of maxima and minima temperatures in the beds and outside.

On May 6, the varieties Las Almas, San Felix, Big Ohio, and Havana Seed Leaf appeared above the surface. Some seedlings of the Yamaska also showed up. On the 8th the germination was general, with the exception of the Cuban, Persian Rose and Feuille d'Or. The latter two varieties did not germinate at all; as to the Cuban, the germination was very weak; only a few hundred plants were obtained. The seed of the Persian Rose and Feuille d'Or came from seedsmen and those of the Cuban came from Cuba; they must have been very old as their germinative power was very poor.

NOTES ON THE TEMPERATURES.

As may be observed from the attached diagram, the outside temperature kept rather low during the growth of the seedlings; however, the minimum in the beds was always above the minimum outside. During the night of the 25th to the 26th of April, the minimum outside was 18 degrees F., and it was only after the 3rd of May that the outside minimum remained above frost; to that date the lowest temperatures recorded in the beds were 33 degrees F. on the 25th of April and 35 degrees F. on the 2nd of May. In spite of the marked irregularity in the diagram of outside temperatures, it will be seen that the maintenance of a fairly regular maximum temperature in the beds, between 80 and 85 degrees F., offers no great difficulty; it is a question of knowing how to handle the sashes.

FARNHAM.

On June 6th, seedlings were ready for transplanting. There was a plentiful supply of healthy seedlings and well provided with roots. The seedlings of the Brazilian varieties were a little spindly, but in no case were diseases observed. The beds attracted the attention of a number of visitors as, generally speaking, the sowing of tobacco met with poor success in the district, especially the sowing done on hotbeds.

Having an abundance of seedlings, we were able to distribute some 52,000 of them to the less fortunate growers.

TRANSPLANTING.

Preparation of the soil.—The field on which seedlings were planted covers an area of twelve acres. It was drained last fall, well manured with farm manure (18 tons to the acre) and this manure was ploughed under with a rather deep ploughing before the winter of 1913-14.

The preparation of the soil was started on May 26. It consisted of the following: two diskings with the double disk in both directions, four harrowings with the spring harrow; five strokes of the smoothing harrow.

The object of this cultivation was to rid the soil of the couch grass with which it was infested. It was successful to a certain extent and all the couch grass was burnt on the spot. The land being drained, it might have been prepared much earlier. However, we were busy sowing at that time on another part of the farm.

As soon as the land was ready, chemical fertilizers were applied. A field of two acres was set apart for a special test which is reported further on. The rest of the field was treated with a mixture composed of the following per acre:—250 pounds sulphate of ammonia, 150 pounds sulphate of potassium, 100 pounds superphosphate.

Transplanting.—The work of transplanting was started on June 8 with the Big Ohio x Sumatra. The following varieties were planted:—2 arpents of Big Ohio x Sumatra, 2 arpents of Comstock Spanish, 1 arpent of Las Almas, 1 arpent of San Felix, 2 arpents of Yamaska, 2 arpents of Havana Seed Leaf.

This work was extremely difficult owing to the extreme drought and the strong west winds which lasted twenty-seven days. In order to gain time, two machines had to be used.

The drought and the insects (cutworms and wireworms) caused tremendous injury. Although poison had been spread on the field and although a large quantity of water had been used in planting, the crop had to be harrowed up and replanted. Some varieties, and particularly the Yamaska and San Felix, were planted three times. As may be imagined, the recovery was very difficult and the misses very numerous; this is why the area in tobacco is not as large as was provided for in our programme.

To avoid a complete destruction of our crop it had to be watered,—slow, painful and very expensive work. A fire hose was kindly lent us by the town of Farnham and we were authorized to take water from a hydrant. The water was taken to the field in molasses tuns and spread with hand sprinklers, by a crew of eighteen men. This work having to be repeated owing to the persistence of the drought, an endeavour was made then to make it as cheap as possible. A tun, perforated at the bottom, was fitted with a cork two inches in diameter; three inches from the cork a sloping board was put against which the water was thrown. The whole thing was carried in a cart, the wheels of which had to be set closer so as to be able to pass through the crop. This rather primitive system was extremely useful; the crop was watered liberally several times, water being thrown on two rows of tobacco at the same time. In this way it is possible to water one acre in a day with an intermission of four hours from 11 a.m. to 3 p.m., to avoid burning the plants. This system of watering was continued till June 20 on which date a good rain created almost favourable conditions.

During all this time a continual war had to be waged against insects. Paris green was used in various ways.

FARNHAM.

1. In the water of the planting machine at a rate of one ounce, one and a half ounce and two ounces, dissolved in a little acetic acid very diluted.

2. Usual application with flour, 1 per cent.

3. Ordinary mixture with a little molasses (molasses dissolved in a little water then mixed with the usual combination).

4. Usual mixture with Paris Green and pyrethrum powder, equal parts.

Each different mixture was tried on four rows, each of which contained 285 seedlings.

The damages caused by insects were practically the same in all cases, with the possible exception of mixture No. 4, but the results were by no means conclusively in favour of this mixture. A good way to destroy the cutworm is to hunt them at night with a good lantern; a considerable quantity may be picked up in a few hours.

Lead Arsenate.—Lead arsenate was also used to destroy insects. It gives perhaps better results than copper arsenate, owing to the fact that it does not dissolve readily in water and it adheres very strongly; it has a far more lasting effect. The difference in price is insignificent and 0·50 per cent lead arsenate gives at least as good results as 1 per cent Paris green.

The small experimental varieties: Grand Canadien, Comstock 104, 106, 108 were planted on June 18. This crop includes a total of 1,238 plants; it was hand-planted on a field situated along the river front. The little Cuban we had was planted in the ravine as it was desired to ascertain the fertility of this part of the farm, on which a good deal of filling-in had been done. This is reported on further on.

After the 18th of July we had a period of great heat which, coming after a few days of rain during the previous week, did much good to the crop. It may even be stated that the situation was saved by this welcome heat. Unfortunately, three weeks had been lost. The end of July and the month of August were very favourable and the crop had become almost normal in appearance. Then a violent hailstorm practically destroyed all the crops in the Yamaska valley and twenty-five per cent of our crop (August 19).

The details of the work necessary for the cultivation of our tobacco field is given in the following table:—

Varieties.	Area.	Hoeing.	Topping.	Suckering.	Harvest.
Big Ohio	2 arpent.	3 hoeings with the hoe	28 29 July	10-11 Aug	22-24 Aug.
Comstock	2 "	Hoe and 3 with the hand hoe	30-31 "	12, 13, 14, 21, 25 Aug.	26-27 "
Yamaska	1 "		1 Aug	15, 17, 20 Aug.	29-31 "
Havana Seed Leaf	½ "		4 "	15, 17 Aug. & 1 Sept.	2 Sept.
Las Almas	1 "		6 "	19 Aug.	4 "
St. Félix	1 "		7 "	19 "	5 "

SELECTION.

This year, as in the past, the work of selection was done with special care.

Two types were selected in the Big Ohio x Sumatra: (1) Round leaf type and (2) Elongated leaf type.

The first of these types promises to give an elastic leaf rather fine, of good diametral ratio, (3-5); the second, a longer leaf, with a longer point, a fine texture, not quite so elastic; it may be used for light pipe tobacco.

FARNHAM.

The selection in the Comstock variety was done with a view to secure an increase in yield by a larger size of the leaf or by the closer setting of the leaves on the stem and therefore a larger number of leaves. This feature was the one on which most stress was laid with a view to maintain the "binders" characteristics; fine elastic leaf, with a round oval shape and an average development.

All our selected seed plants have suffered more or less from the frost. However, owing to their rather limited number, it was possible to protect them by means of artificial shelters composed of bags held in place by laths. Only a few heads were completely destroyed, the others remained normal and a germination test gave very satisfactory results.

HARVESTING.

Instead of taking the tobacco directly to the curing barn as was done in the past, it was submitted, this year, to a rather long wilting on the field, which, in some cases, lasted five days. The following method was adopted: stands composed of cross-pieces from 3 to 4 inches thick and braced by posts of the same size supported at the bottom by braces, were built in the field. The laths loaded with tobacco were placed on these stands in the same position that they occupy in the curing house, but a little closer, the leaves being in contact with each other. When necessary, white damp-proof canvas was used to shelter the tobacco from the rain, from the strong wind, from the dew, the dampness of the night. In two or three days the tobacco becomes much more elastic and changes colour. By this method, from ten to fifteen days may be gained on the time spent in the curing barn. This long period of wilting in the field has important advantages; in the first place a large quantity of tobacco may be cut every day, without running the risk of leaving some of the tobacco until the next day on the field; then, the tobacco being very elastic, is much more easily taken to the curing house. Lastly, it may be stripped much earlier; this year the stripping was completed long before other growers had stripped theirs.

As stated in our report for 1913-14, the rack used for the hauling of tobacco has been modified and this modification has given very good results. The frame loaded with laths can be easily removed, without injuring the leaves in any way. The accompanying plate will give a better idea of this improvement than any description that could be made.

CURING.

On the 7th of September the whole of our crop was in the curing-barn and all the leaves had the yellow tinge which indicates the first phase of curing. Dry weather prevailed during most of September and the conditions were very favourable to the curing. Unfortunately October was rather cold and wet. Mould appeared on some leaves and artificial means of curing had to be used. The system which was used gave us excellent results and can be strongly recommended to the growers. This system is as follows: sheet iron heaters are placed at twenty foot intervals in the curing-house and charcoal fires are made. These heaters, which measure 18 by 12 inches in diameter, are fitted at the lower part with a rather close grate, supported on two pieces of iron, one inch wide and turned in a half circle. The heater is lighted outside and then taken into the curing-house. When in place, the heater is covered with a conical-shaped cover, also of sheet iron, which prevents the emission of sparks. With one day's fire, even in damp weather, the tobacco may acquire an almost brittle texture. Of course, when the curing-barn is heated, all lateral openings should be closed.

FARNHAM.

STRIPPING.

Our crop could have been stripped early in November. Unfortunately, the weather remained very dry and we had to wait for rain as late as the 18th and 19th of November; it was only at that time that the tobacco became sufficiently supple to be safely taken down. This rainy period was of short duration and as the return of drought was anticipated, a large quantity of tobacco was taken down at one time, so as to keep our men busy at stripping. When stripping, the leaves that were very much injured by hail were put aside, the rest was graded in three classes, bottom leaves, median leaves and top leaves and the whole was put in bales of 40 to 50 pounds, slightly compressed.

YIELDS AND QUALITY OF THE PRODUCTS.

As soon as the stripping was over, that is on the 15th of December, our crop was taken to J. M. Fortier and Co.'s warehouse and at once put under treatment.

After checking the weight of the bales, the leaves of the same character were put in heaps of two and three thousand pounds. The top leaves were put in the bottom layers, then the bottom leaves, and the median leaves on top. The bottom leaves should always be put in the centre of the heap, as they have much less body than the other leaves and are often very slow in fermenting. The heaps were made in special fermenting rooms and covered with thick woollen blankets. On the morning of the 21st, the temperature of the four heaps was, respectively, 31° C., 32° C., 24° C., and 33° C. They were taken down and grading was started at once. Sixty-five men took part in this work. A number of men were grading according to the tissue "binders No. 1," "binders No. 2," "yellow tobacco" and "trash." Another group was grading into lengths, 12, 14, 16, 18, 20, 22, 24, 26 inches, and putting the tobacco into hands that were packed into boxes as they were ready. On account of the injuries caused by hail, a rather large quantity of tobacco was not graded at all; it was simply put into hands and packed into pressed bales weighing from 50 to 60 pounds each. The yellow tobaccos went through the same process of grading but were sold without being fermented.

During the short fermentation to which the tobaccos were submitted before grading, the rooms were kept at a very hot and a very damp temperature. The dampness was caused by steam freely admitted in the rooms during ten minutes every hour.

Big Ohio x *Sumatra.*—This variety gave us a total yield of 1,982 pounds for two arpents, which is at the rate of 991 pounds per arpent. These 1,982 pounds included: 1,012 pounds of median leaves, 262 pounds of bottom leaves, 427 pounds of top leaves, 259 pounds of refuse, 22 pounds of leaves harvested on seed plants.

Of this total, 510 pounds were packed in boxes, including 173 pounds of binders No. 1, and 337 pounds of binders No. 2.

The Big Ohio x Sumatra requires further selection but it will certainly fulfil our expectations. On account of the hail, 943 pounds were simply packed in bales as they could not be used either as binders or as fillers. In an average year, a crop should give at least sixty per cent of binders, including forty per cent of binders No. 1. The tissue is closer than it was before and the shape of the leaf more profitable. No leaves in this crop were under 18 inches long and the greater proportion were 22 inches long, that is 328 pounds out of 510 graded; there were 166 pounds of 20-inch leaves.

Comstock.—Two arpents of this variety gave a total yield of 2,098 pounds, as follows: 851 pounds of median leaves, 262 pounds of bottom leaves, 600 pounds of top leaves, and 385 pounds of refuse.

Out of 965 pounds graded, there were 561 pounds of binders No. 1 and 404 pounds of binders No. 2. This variety had not suffered so much from the hail as the Big Ohio

x Sumatra. The quantity of Comstock put into bales was only 442 pounds, out of a total yield of 2,098 pounds, instead of 943 pounds of Big Ohio x Sumatra out of a total yield of 1,982 pounds. These figures show that the yields of these two varieties are practically the same; the Comstock gave 398 pounds of leaves 22 inches long and 334 pounds of leaves 24 inches long.

Havana Seed Leaf.—Two arpents of Havana Seed Leaf gave 1,527 pounds, which were graded as follows, while stripped: 285 pounds of top leaves, 693 pounds of median leaves, 349 pounds of bottom leaves, 200 pounds of refuse.

The final grading gave 369 pounds of binders No. 1 and 381 pounds of binders No. 2, a total of 750 pounds that were packed into boxes. The yield of the Havana Seed Leaf is not nearly as large as in previous years. This part of our crop suffered greatly from drought. The planting was finished comparatively late as the crop had to be replanted several times. Nevertheless, the products obtained are good, the shape of the leaf is good and the quality of the tissue is excellent. The length of the leaves varies from 14 to 24 inches; there are 250 pounds of 22-inch leaves, 187 pounds of 20-inch leaves, 19 pounds only of 14-inch leaves and 111 pounds of 24-inch leaves.

Yamaska.—An arpent of this tobacco gave us a total crop of 800 pounds, including: 427 pounds of median leaves, 55 pounds of bottom leaves, 218 pounds of top leaves, 100 pounds of refuse.

As will be noted, there is a very high proportion of median leaves and a low proportion of bottom leaves. This crop gave 134 pounds of binders No. 1 and 314 pounds of binders No. 2. Only 448 pounds were graded, the rest, 309 pounds, chiefly made up of bottom leaves and of leaves injured by the hail, was pressed into bales. The 20 inch leaves formed the greater proportion of the total, 143 pounds, then came the 18 inch leaves, 136 pounds; 14 inch leaves, 10 pounds and 24 inch leaves, 14 pounds.

After the Comstock Spanish, the tissue of best quality is found in the Yamaska. This is a promising tobacco and we should not be surprised to see it considered one day as the standard for binders tobacco in our country.

Las Almas.—This is a Brazilian tobacco which is exclusively used for fillers.

The yield in weight is rather low, it seems to be slow in getting acclimatized. An arpent gave 559 pounds, including 184 pounds of top leaves, 260 pounds of median leaves, 115 pounds of refuse.

All the bottom leaves were of such a texture and of such a size that they were graded with the median leaves. The results of the grading were as follows: 391 pounds of good fillers, including 162 pounds of 16 inch leaves and 138 pounds of 18 inch leaves.

San Felix.—Another Brazilian variety which is still less productive than the Las Almas.

The total crop was 425 pounds, including 11 pounds of refuse when stemming: 125 pounds of top leaves, 167 pounds of median leaves, 21 pounds of bottom leaves.

The 305 pounds that were accepted at grading included 133 pounds of 16 inch leaves and 89 pounds of 18 inch leaves.

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NUMBER OF LEAVES PER POUND.

In order to make a comparison between the various varieties grown on our station, the number of leaves per pound has been ascertained. The following figures represent an average of three experiments in which different weights were used.

The crop of St. Jacques l'Achigan being handled at Farnham at the same time as ours, it was possible to compare the products of the northern counties with those of the south shore of the St. Lawrence.

(a) *Big Ohio* x *Sumatra* (Farnham)—

18 inches,	76 leaves to the pound.	
20 "	62	"
22 "	48	"
24 "	41	"
26 "	35	"

Big Ohio x *Sumatra* (St. Jacques l'Achigan)—

18 inches,	70 leaves to the pound.	
20 "	59	"
22 "	42	"
24 "	31	"

It may be concluded from these figures that, for this variety at least, the leaves obtained at Farnham are much thinner than those obtained in the north shore counties.

(b) *Comstock* (St. Jacques l'Achigan)—

16 inches,	80 leaves to the pound.	
18 "	74	"
20 "	70	"
22 "	65	"
24 "	60	"

Comstock (Farnham)—

16 inches,	77 leaves to the pound.	
18 "	60	"
20 "	53	"
22 "	46	"
24 "	38	"

The results of this comparison between the two Comstocks may seem strange, as it has been repeatedly shown that the binders grown in the Yamaska district are much thinner than those of Montcalm, Joliette, etc. The explanation in this case is as follows: the St. Jacques Comstock is distinctly lighter than the Farnham Comstock, but it should be noticed that the first has a dry, almost lifeless texture; to use a technical term, it has no body. Furthermore, out of the 961 pounds of Comstock coming from St. Jacques, 280 pounds of yellow tobacco were eliminated; this yellow tobacco is practically dead tobacco, good for cigarettes, but absolutely useless for fermenting purposes. There was no yellow tobacco in the Farnham crop.

(c) *Yamaska* (Farnham)—

16 inches,	79 leaves to the pound.	
18 "	63	"
20 "	57	"

Yamaska (St. Jacques l'Achigan)—

16 inches,	77 leaves to the pound.	
18 "	58	"
20 "	50	"
22 "	42	"
24 "	36	"

These figures show very plainly that the St. Jacques Yamaska is, as usual, thicker than the same variety grown at Farnham. There is also to be noted in this case, as in the case of the Comstock, that the thin leaves in the St. Jacques crop have not so good a texture as the thin leaves of Farnham. As a matter of fact, some 60 pounds of yellow tobacco had to be taken out of the crop of Yamaska of St. Jacques.

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As may be noted in the following table, among all the binder varieties grown, the Havana Seed Leaf is the thickest.

(d) *Havana Seed Leaf*—

16	inches,	66	leaves to the pound.
18	"	52	"
20	"	45	"
22	"	38	"
24	"	29	"

FLUE CURING.

A special kiln for artificial curing of tobacco by means of hot air was built on the Farnham experimental station. This experiment had a two-fold object: (1) To open a market for this tobacco in the province of Quebec; (2) To use the cigar tobaccos more or less injured by the hail which falls rather frequently in the Yamaska valley. In this kiln, which measures 19 x 20 feet, the product of two acres of Comstock Spanish purchased from a farmer of the neighbourhood was treated in two lots. The results of this experiment were not very satisfactory. However, they showed that varieties suitable for this method of curing could give valuable products in our province, at least so far as the colour is concerned.

The results of the first lot cured were not quite so good as those of the second. It was our first experiment. The curing-house was over-filled and it is likely that the tobaccos had not been sufficiently wilted on the field.

As a matter of fact this crop had been harvested in the midst of a rainy season, on account of which it was not able to reach a proper degree of maturity.

As soon as it was sufficiently supple, this flue-cured tobacco was stripped. It was graded in two colours. The result of this grading is as follows:—

First lot.—Dark coloured tobacco, 904 pounds; light coloured tobacco, 287 pounds.

Second lot.—Dark coloured tobacco, 271 pounds; light coloured tobacco, 215 pounds.

As may be seen, the proportion of light tobacco is much larger in the second lot than in the first one. With the first lot, the curing-house had been overfilled, the laths were placed too close, the ventilation was poor, the condensation active and some fermentation occurred when the tobaccos were on the laths. The total amount flue-cured was 1,677 pounds harvested on two arpents, or 838·5 pounds per arpent. The average yield of the Comstock being estimated at 1,200 pounds per arpent, this flue-curing caused therefore a loss of 380 pounds, which is at the rate of 30 per cent.

This loss is, of course, much too high and much over the decrease in weight resulting from the evaporation of water or the loss of solid matter caused by such treatment. It shows that this crop, which had to be harvested before being sufficiently ripe, on account of the frost, was not in good enough condition to be submitted to this process.

EXPERIMENT WITH CHEMICAL FERTILIZERS.

This experiment was carried on on a field of two arpents which had been planted on the same day with Big Ohio x Sumatra. The object was to ascertain, as definitely as possible, the formula of sulphate of ammonia, sulphate of potash and superphosphate which gives the best results, under certain conditions of soil and climate. These two arpents were divided into sixteen equal plots and the following quantities of fertilizers were applied per arpent:—

Number.	Sulphate of ammonia.	Sulphate of potash.	Super-phosphate.
	Lb.	Lb.	Lb.
1	150	150	100
2	200	150	100
3	250	150	100
4	300	150	100
5	250	90	100
6	250	120	100
7	250	150	100
8	250	180	100
9	250	150	60
10	250	150	80
11	250	150	100
12	250	150	120
13	150	90	60
14	200	120	80
15	250	150	100
16	300	180	120

Apart from these chemical fertilizers, the sixteen plots also received barnyard manure at the rate of 16 tons per arpent. This manure was ploughed under in the fall of 1913 by a rather deep ploughing. The preparation of the soil in the spring was identical for the sixteen plots. In short, an endeavour was made to obtain conditions as nearly similar as possible.

A departure was made from the formula that had been used for a rather long time viz.: 250 pounds sulphate of ammonia, 150 pounds sulphate of potash and 100 pounds superphosphate to the arpent; the various mixtures employed were made up of varying proportions of the same elements. A glance at the accompanying table will show that there are, as a matter of fact, four distinct experiments. For instance, in plots No. 1, 2, 3 and 4 the quantity of sulphate of ammonia alone varies; this is a test of nitrogen. In plots 5, 6, 7 and 8, it is a test of potash as the quantities of sulphate of ammonia and of superphosphate do not vary. An experiment with phosphoric acid was made on plots 9, 10, 11 and 12. Lastly, the original formula was changed in an experiment on plots 13, 14, 15 and 16.

As it was desired to compare the results as soon as possible, it was decided to compute the yield instead of taking the total. When the crop was being stripped the leaves from two hundred plants on each of the sixteen plots were weighed separately and the basis of computation was 7,500 plants per arpent. The results obtained are given in the following table:—

—	No. of plots.	Weight of leaves of two plants.	Yield per acre.
		Lb.	Lb.
Nitrogen experiment	1	31	1,152
" "	2	33	1,226
" "	3	38	1,415
" "	4	40	1,500
Potash experiment	5	29	1,087
" "	6	31	1,152
" "	7	38	1,415
Phosphoric acid experiment	8	41	1,537
" "	9	36	1,340
" "	10	41	1,537
" "	11	40	1,500
" "	12	37	1,377
General formula	13	30	1,115
"	14	31	1,152
"	15	33	1,226
"	16	38	1,415

Conclusions.—Plots 9 and 10 gave the best yields: the first of these plots had received 250 pounds sulphate of ammonia, 180 pounds sulphate of potash and 100 pounds superphosphates; the second, 250 pounds sulphate of ammonia, 150 pounds sulphate of potash and 80 pounds superphosphate. The conclusion is that the nitrogenous element plays the dominant part. A glance at these figures shows that the yields are in proportion to the quantity of sulphate of ammonia applied; plots 4, 8, 12 and 16 are the best yielders of the series. Furthermore, when considering the first four plots (experiments on nitrogen) it is seen that the yields increase as the quantity of sulphate of ammonia is increased; for a double quantity of nitrogen there is an increase in yield of 348 pounds.

No less important is the part played by potash.

The two maximum yields of 1,537 pounds correspond to a strong application of sulphate of potash (180 pounds in the first case and 150 pounds in the second). It appears that potash has more effect than nitrogen since the total yield obtained from a mixture of 300 pounds of sulphate of ammonia and 150 pounds potash (No. 4) is not so large as the yield resulting from the application of 250 pounds of sulphate of ammonia and 180 pounds of sulphate of potash (No. 8). As for nitrogen, the more sulphate of potash is applied the higher the yields are, with this exception that the maximum yield of 1,537 pounds corresponds to the maximum quantity of sulphate of potash used (No. 8).

With regard to phosphoric acid, things are quite different. The results obtained on plots 9, 10, 11 and 12 show that only a comparatively small quantity of phosphoric acid is required; 80 pounds would be the most profitable quantity. With equal quantities of nitrogen and potash, an increase in the proportion of phosphoric acid causes a material reduction in yield. An excess of superphosphate appears to be detrimental, as shown by the results on plot 16. This plot 16, which had received the greater quantity of nitrogen, potash and phosphoric acid, has not given the highest yield (only 1,450 pounds). One of the most satisfactory results of this experiment is that we now have sufficient data to establish an optimum formula, that is, the most profitable formula, since, according to our figures, the yields may be represented by a curve passing through the maximum. The whole question now is to ascertain what this maximum is.

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A choice therefore has to be made between the formula used on plots 8 and 10. Before concluding, however, let us examine the crop obtained on these two plots. As regards tissue, plot 8 gives a thicker leaf than plot 10, as elastic as the latter but with far better burning quality. Therefore, there is a larger number of leaves per pound in No. 10 than in No. 8, which is very important as thin binders always have the preference. Again, in No. 10 there are 24 pounds of median leaves for 200 plants against 20 pounds in No. 8. Outside of the burning quality, the formula used on No. 10 gives the better results.

To sum up, everything considered, viz., yield, tissue, burning quality, the following formula may safely be recommended: 250 pounds sulphate of ammonia, 180 pounds sulphate of potash, 80 pounds superphosphate.

The above is a combination of formulæ 8 and 10 in which the quantity of potash used in No. 8 takes the place of the quantity used in No. 10.

OTHER CROPS—OATS AND CLOVER.

The preparation of the soil for seeding was started on May 12. The following instruments were used: double disc-harrow, grubber, smoothing harrow and roller. This work was done under good conditions. Eight arpents were prepared in this manner and sown with Banner Oats and clover—one bushel and a half of oats and 15 pounds of clover per arpent. The germination was good for the oats as well as the clover. A few days after the oats were up, they were rolled twice. We did the same with our clover last year as soon as the ground was in good shape.

The oats gave a fairly good yield, 22 bushels to the arpent as an average, giving a total crop of 216 bushels that were kept for the horses. The thirty arpents of clover sowed in 1913 gave a total crop of forty tons, which is not quite one and a half tons per arpent. Two tons were obtained on some parts but in the upland, near the river, the crop was rather poor and it had to be cut early on account of the presence of daisies, mustard and other weeds.

With the exception of eight arpents which are now in clover, the whole area of the farm was ploughed with a double Brabant. This plough, which is comparatively little known in this country, does remarkable work. Its chief advantage is a considerable saving of time, as it can be reversed at the end of the furrow, without turning.

On the part of the farm selected for mixed crops, eighteen tons of manure to the arpent were ploughed under 9 inches deep.

IMPROVEMENTS.

Work in the ravine.—As stated in last year's report, the object of this work was to increase by four arpents the arable part of the farm. A dam was built in 1913 and the ditch was straightened out this year. This has required a month and a half of work. In several places the ditch was ten feet wide, it was filled with the earth from the numerous knolls that were in the ravine. The two abrupt grades were decreased, which enabled us to level the ground at the same time.

A little Cuban was planted on the new part of the farm. The crop was not very large but there are reasons to believe that this part will become one of the most fertile.

The rest of the ravine was sown in buckwheat which was ploughed under early in the fall. A good deal of clearing was done and practically the whole of the farm was ploughed in the fall. There is now about only half an arpent that could not be ploughed before the winter.

After completing the house of the manager, a cement sidewalk 500 feet long was laid down and a large quantity of earth hauled for the lawn.

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Lastly, to collect the water on the road and on the western part of the farm, it was necessary to place underground a tile drain 18 inches in diameter and 250 feet long. This drain starts from the road, crosses a part of the ravine and empties into the ditch.

Drainage.—Some fifteen arpents of this farm had been drained in 1913 as reported. This year, six more arpents were drained between the Canadian Pacific railway line and the road leading from Farnham to St. Brigide. The nature of the soil and of the subsoil was determined. It is as follows: (1) an arable layer, 10 inches deep, composed of sand with a little grey clay, very fine; (2) a layer of yellow sand with a fair proportion of clay, fairly compact, 20 inches thick; (3) blue sand with marl, as far as the water level.

Owing to the composition of the soil and the lay of the land the following method was adopted: small drains are laid along the line of the greatest slope and they open in the main drain at a very acute angle. These small drains have a regular slope, increasing as they go, but never exceeding 0·065 per cent. They are placed at an average depth of 5 feet 6 inches and 45 feet apart. A collector, 6-inch interior diameter and 380 feet long collects all the water from the small drains. This collector empties into a ditch which throws itself into the Yamaska river. For reasons of grade and facilities, the collector was passed under the road, to enable us to use a good discharge.

Five thousand two hundred and twenty-six feet of drain were required for this work. Another field of three arpents was also drained. This field has the shape of an inverted roof, the ridge of which has a rather strong slope. A six inch collector was placed along this road and three smaller drains 125 feet long each, on each side. The main drain, on account of the configuration of the land, has the shape of a Y.

LABORATORY.

Nicotine tests.—About seventy-five samples of tobacco were tested to ascertain the percentage of humidity. Schloesing's method was followed in this test: a standard tobacco is made, analysed very carefully, and all other tobaccos are expressed in proportion of this standard.

The extraction of nicotine, in the case of the standard tobacco, was made by repeated washings with salt water. This water was then treated with ether. This operation required three passages of ether. The results of this first analysis were checked by another analysis with Tungsten which is also well known as the best reactive for alcaloids.

The standard tobacco was a mixture of Big Ohio and Erbesanta; the following yields in weight of nicotine per hundred pounds of dry tobacco were obtained:

1. Colorimetric method..	7·77 %	7·80 %
2. Tungsten method..	7·78 %	7·79 %

The actual analysis was computed at 7·785 %.

The washings, as for the other analyses, were made in duplicate.

The samples to be examined were treated with soda to displace nicotine, then gasoline was used as a dissolvent after twelve hours' action. In short, it is the Allegrain process, slightly modified.

The virages were made in the presence of distillated water which makes it much easier to ascertain the passage from the alcaline condition to the acid condition. Twelve samples were operated on and of course an analysis of the standard was made for each series. In all cases the complete extension process gave us results one-tenth higher than those obtained with the rapid method.

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The results of the nicotine tests made with the tobaccos of the 1914 crop are given in the following table:—

ORIGIN of Tobaccos Analysed and Indications of Varieties.

Central Experimental Farm, 1914.	Per cent of nicotine in any tobacco.	
Persian Rose	2·09	2·14
Yamaska	2·30	2·38
Belgian	2·24	2·28
Maryland	2·88	3·00
Dark Maryland	3·08	3·12
Perfum d'Italie	3·14	3·12
Comstock (St. Jacques seed)	2·75	2·80
" (St. Césaire seed)	2·13	2·11
Connecticut Seed Leaf	2·91	2·95
Connecticut Broad Leaf	2·77	3·02
Big Ohio x Sumatra (median leaves)	2·50	2·52
" " "	2·54	2·57
St. Félix (median leaves)	2·93	2·96
Las Almas (median leaves)	2·87	2·91
General Grant	3·28	3·34
Canelle P	2·64	2·70
Canelle R	2·50	2·50
Small Havana Mir	2·31	2·25
" Bl	2·28	2·31
" Ferg	2·25	2·23
Tabac Rouge Ferg	2·15	2·18
Feuille d'Or	1·94	2·02
Big Havana	2·73	2·70
Herzégovine Stolak	3·66	3·71
" " (imported seed)	3·25	3·22
" Giant	3·54	3·52
" "	2·58	2·55
Virginia x Herzégovine No. 37	2·94	3·00
" " (imported seed)	2·75	2·75
" " x Virginia No. 52	3·15	3·11
Erbasanta Crop 1913)	8·93	8·95
(Experimental Station, Farnham, P.Q., 1914.)		
Comstock Spanish 1st cure (light)	1·80	1·87
" " 2nd cure (light)	2·14	2·18
" " 1st cure (dark)	2·00	2·02
" " 2nd cure (dark)	2·25	2·30
(Experimental Station, St. Jacques, P.Q., 1914-		
Comstock Spanish	2·40	2·25
Herzégovine Giant	2·42	2·44
(Harrow Station, Ont., 1914.)		
Herzégovine Stolak (light red)	2·50	2·48
" " (yellow)	2·26	2·24
Virginia x Herzégovine (light red)	2·44	2·51
" " "	2·30	2·32
" " (yellow)	2·25	2·28
Warne (dark red)	2·00	2·16
" (yellow)	2·12	2·15
" bottom leaves—lugs	2·42	2·50
" (yellow)	2·18	2·16
White Stem Oronoko (yellow)	2·30	2·35
" " (red)	2·32	2·36
Yellow Pryor (dark red)	2·35	2·40
" (light leaves)	2·43	2·11
Virginia x Herzégovine x Virginia (light red)	2·57	2·54
" " " (dark red)	2·60	2·57
Broad Leaf Stand up Burley (dark red)	2·71	2·70
" " (light red)	2·67	2·65
" " (lugs)	2·23	2·25

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ORIGIN of Tobaccos Analysed and Indications of Varieties.—*Continued.*

Central Experimental Farm, 1914.	Per cent of nicotine in any tobacco.	
Improved White Burley (light red)	2·38	2·42
" " (dark red)	2·25	2·25
" " (yellow)	2·26	2·24
" " (lugs)	2·26	2·30
Miscellaneous Crop, 1914.		
Havana Seed Leaf	2·80	2·84
Comstock Spanish (seed plant leaves)	2·97	3·00
White Burley (Picton, Ont.)	1·96	1·94
Green River (Walkerville, Ont.)	2·44	2·51
Comstock (Ste. Catharine)	2·71	2·68
Comstock Spanish	3·26	3·35

The above figures represent the percentage of nicotine in dry tobacco. The average proportion of moisture in the standard tobacco was 16·90 per cent. For the determination of the nicotine in the standard tobacco, an acid sulphuric solution was used, of such strength that each division of the pipette corresponded to 0·005 gram of nicotine. This method is very rapid, as a large number of analyses may be made at the same time and it is not necessary to know exactly the strength of the sulphuric acid solution or the proportion of moisture. The main thing is to have the standard sample and the tobaccos which are to be examined under the same conditions as regards grinding, moisture, temperature, etc.

ANALYSES OF SOILS.

An analysis of soils was made at the Farnham farm to ascertain the needs of the soil and the variations in the chemical composition. The figures show that the average fertility of the soil of the Farnham station could be improved upon.

In one case only (No. 10) chlorine was found. This is the plot which gave poor burning tobacco.

ANALYSES of Soils at Farnham, Que.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.
Moisture	7·64	8·15	9·40	6·76	6·70	7·81	6·73	5·84	6·00	6·25	6·40
Nitrogen	0·061	0·044	0·040	0·54	0·058	0·031	0·062	0·054	0·048	0·057	0·052
Phosphoric acid	0·71	0·90	0·88	0·66	0·69	0·62	0·77	0·84	0·79	0·83	0·71
Potash	2·40	2·53	2·29	2·38	2·47	2·33	2·41	2·41	2·39	2·45	2·50
Peroxide F. M	4·20	4·18	4·02	4·17	4·21	4·01	4·16	4·21	4·19	3·92	4·00
Lime	0·54	0·60	0·55	0·58	0·60	0·59	0·52	0·52	0·47	0·57	0·61
Humic acid	4·80	4·50	4·00	3·93	3·94	4·00	4·40	4·52	4·73	5·00	4·77
Silica	68·10	67·40	69·16	67·14	68·17	69·20	69·22	70·11	70·16	68·70	70·40
Alumina	12·00	10·44	11·17	11·28	11·80	11·44	12·10	11·81	11·74	11·92	11·09
Magnesia	0·40	.....	.....	0·38	.....	.....	0·37	.....	0·44	.....	0·41
Sulphuric acid									Light		Heavy
Nitric acid											
Chlorine									traces.		traces.

It may be stated that the various parts of the farm have practically the same chemical composition. It is a soil of average fertility, fairly rich in essential elements.

With good manuring, a judicious use of chemical fertilizers and a short rotation, this soil should be put in good condition fairly quickly.

In 1915 we will again be at the starting point of the three-year rotation and a rather important improvement is already noted. For instance, plot No. 1, which will be in tobacco for the second time in 1915, is the richest in nitrogen and humic acid, and it is well known that, in a work of this nature, the proportion of nitrogen is the most important data.

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STATION OF ST. JACQUES L'ACHIGAN, QUE.

The following varieties of tobacco were grown on this station in 1913-1914:—Comstock Spanish, Cuban, Yamaska, Big Ohio x Sumatra.

Other varieties were also tried on a small scale in the garden, behind the building which is used as office and stripping room, as follows:—1 White Burley, 1 Warne, 1 Giant Herzegovina.

SOWING.

Some 600 square feet of beds were used for seeding; semi-hotbeds were used, that is, the layer of fermenting manure was replaced by a layer of tobacco stalks, well packed down.

The sowing was done on the 27th of April, dry seed being used on black mould, which had been disinfected with formalin. The seedlings were up on May 3, six days later, except on the bed of Cuban which was up only on the 9th of May. The Cuban seed was old and of poor quality.

The development of the seedlings took place without incidents, with the exception of a little efflorescence on the surface, caused at the start by the rapid evaporation of too concentrated solutions of chemical fertilizers. They were quickly reduced by light sprinklings, often repeated.

A sufficient number of seedlings was obtained with the exception of the Cuban which were a partial failure. On account of this fact, a reduction was made in the area which was to be planted in this variety.

TRANSPLANTING.

The area to be planted in tobacco had been in clover in 1913. It was ploughed in the fall but the manure that it was intended to apply in the fall came much too late. It was spread on top of the ploughed land and incorporated with the disc harrow. It was ploughed under in the spring on May 12. Chemical fertilizer was mixed with the soil by means of the disc harrow, on the 6th of May, the following quantities being used:—

Sulphate of ammonia	270 pounds per arpent.
Superphosphate	135 "
Sulphate of potash	200 "

The preparation of the soil was completed the day before transplanting by double discing crossways, and the smoothing harrow. Transplanting was started on the 3rd of June, taking advantage of the wet period which, unfortunately, did not last long enough.

The seedlings suffered a good deal from the drought and the cutworms which displayed extraordinary activity in the spring of 1914-1915; a great many had to be reset until the end of June.

The growth was rather slow. The crop suffered very much from the drought in spite of the repeated cultivation by which it was endeavoured to reduce the evaporation at a minimum. However, the Comstock, Big Ohio x Sumatra and Yamaska gave a fair crop but the Cuban did very poorly.

The White Burley and Warne, which were grown to find out if they could ripen soon enough to be converted into yellow tobacco by the flue-curing process, were much too late. It was the same with the Big Havana.

These three varieties were far from reaching their full size. The results were not much better with the Giant Herzegovina. It should be stated, however, that the soil in the corner of the garden where these varieties were tried, was much heavier than the average soil on which tobacco is grown in the northern region. Some plants of Giant Herzegovina grown in our foreman's garden on a light soil, in the north of St. Jacques, gave undersized leaves but with a rather bright colour and a more supple texture than those of the same variety of tobacco grown at Ottawa. The following table shows the date of transplanting, the number of seedlings used and the yield in weight per arpent and per acre of the varieties of tobacco grown at St. Jacques in 1914.

Date of planting out.	Varieties.	Number of plants.	Gross weight.	Yield.	
				Per arpent.	Per acre.
			Lb.	Lb.	Lb.
June 3-4....	Comstock Spanish	6728	984	1263	1490
" 4-8....	Yamaska	3996	480	1038	1225
" 4-8....	Big Ohio x Sumatra	4144	670	1396	1647
" 4-8..	Cuban	3600	198	534	630

The yield per arpent is satisfactory for a season like 1914, with the exception of the Cuban. However, they would be much better if it were not for the system of ploughing that we have to use on the station of St. Jacques, in order to facilitate the escape of the water. The plants in the low parts of the land are always undersized, in spite of the tendency among the farmers to put the rows next to the furrows wider apart, a practice causing a loss of space that might be avoided if the ground for tobacco was drained.

SELECTION.

The main part of the work of selection was done on two varieties, Big Ohio x Sumatra and Yamaska. The aim for the first of these varieties is to obtain a good type of pipe tobacco with a large leaf, a light texture, and several types of tobacco for cigar wrappers. In the Yamaska, an endeavour was made to select binder types yielding as large proportion as possible of leaves of 20 to 22 inches long, with an oval to rounded shape.

WILTING ON THE FIELD.

The object of wilting on the field is to make the leaves more supple and reduce the breakage to a minimum during the hauling from the field to the curing-house and the hanging up of the tobacco. There is another advantage: a large quantity of water is eliminated before the tobaccos are put in the curing-barn and the duration of the curing is therefore materially reduced.

However, when wilting is done in the usual manner: the tobaccos are left in small heaps on the field for a rather long time, the leaves are exposed to various injuries, showers, fermentations, etc., and the prolonged contact with the soil has a tendency to fill the leaves with mud or sand, which stays with them until they are delivered at the warehouse or at the manufactory.

The use of movable stands could do away with all these objections. The tobaccos are hung up a few hours after cutting, they remain only a short time in contact with the soil and are thus protected from the rain as green tobaccos are very little injured

by the latter when not in heaps. The laths should be set sufficiently close to induce a slight fermentation, causing a wilting and yellowing of the leaves, but not so close as to prevent the rainwater from running out quickly in case of a sudden shower. A damp-proof canvas cover should be used during the night, against rain or frost.

CURING.

The use of charcoal heaters has given very good results on this station. These heaters are used in the latter part of the curing when it is desired to reduce the leaves and to avoid moulding. With a little practice this method may be very useful during the first part of the curing (yellowing of the leaves) when fears of pole burn are entertained on account of the prolonged rain.

TAKING DOWN AND GRADING.

At St. Jacques station the crop was taken down at the end of November. It was at once stripped, graded in bottom, median and top leaves and trash, and shipped to Farnham at the end of December for final grading and packing.

The St. Jacques crop suffered a great deal from the drought which was the cause of the great proportion of yellow leaves. These yellow leaves find a ready sale on the market but their production is always accompanied by a lowering of the general value of the crop as well as a decrease in weight.

EXPERIMENTAL TOBACCO STATION, HARROW, ONT.

W. A. BARNET, B.S.A., MANAGER.

The season of 1914 was a very favourable one for the starting and subsequent culture of tobacco. Cool weather and a fair amount of moisture prevailed during the greater part of the planting season. This made it easy to get a uniform stand of plants in the field. Nevertheless the weather conditions were quite favourable for the work of the cutworms. The ravages of this insect were severe in many fields necessitating much replanting.

During the first part of the planting operations the cutworms were held in check by using the poisoned bran mash, putting about one tablespoonful around each plant. In a portion of the area the mash was not used, and there was quite a marked difference in the stand of plants. Much more replanting was required over this area. Considering the number of plants needed for resetting, the pulling and planting of same and the lack of uniformity in the crop in some fields, the writer considers from three years' experience with this preventative, that it is an easily applied, effective and feasible remedy.

CORN EXPERIMENTS.

Manure was applied at the rate of 12 spreader loads per acre to that portion of the ground that was not manured the year previous. One plot about 4 acres, being top dressed in 1913 was neither manured nor fertilized. In short, no fertilizer was applied to the corn ground this season.

Two acres was planted with Golden Glow variety on May 28. The balance of the corn ground was planted with the Improved Leaming. The average yield per acre was 125 bushel baskets. On our soil the Leaming matures fairly well, but it does not come to the same degree of maturity in a given time that the Golden Glow reaches. While the latter variety does not give as large a yield as the Leaming, still the Golden Glow gives better satisfaction, in that it yields a harder, more weighty ear, with a fairly deep kernel closely placed on the cob.

In short the Golden Glow Yellow Dent corn is a variety the writer would recommend judging from our three years' experience with it at the station, and from the results obtained, both in other parts of the county and in one of the leading ensilage growing districts of Ontario.

A part of our corn ground for the 1915 crop is being manured at the rate of 8 loads per acre. Four and one-half acres of clover sod seeded with barley as a nurse crop in 1914, will not require manuring. But that portion of the area which was cropped in tomatoes and tobacco in 1914, and which was seeded with rye as a cover crop will be top dressed at the above rate. No fertilizer will be applied, as the writer does not consider the application of this material is an economical practice in corn growing.

On account of the extension in the area of the experimental station, we expect to grow 10 acres of corn in 1915 and handle the choice ears of the crop according to the most approved methods of curing corn in seed-corn houses. Heretofore we have sorted out the marketable seed corn in the fall, and put it in a dry well ventilated crib. However, this method will not always give seed with a strong germination at planting time, although our customers have been pleased and our business has increased.

COVER CROPS.

RYE AS A COVER CROP.

On account of the tobacco ground being left bare and liable to a loss of valuable plant food through leaching, rye was sown on September 29 and October 1, on the 15 acres planted in tobacco in 1914. The rye made a good top growth. When it reaches a height of a foot or eighteen inches it will be ploughed under in the spring. The writer believes that while rye will not add much plant food it will increase the humus in the soil and prevent wasteful leaching in the early spring.

HAIRY VETCH AS A COVER CROP.

On September 27 hairy vetch was sown by hand in the corn. The crop was then given another cultivation. On account of warm moist weather prevailing the seed germinated rapidly and made a very good top growth before winter set in.

CLOVER AS A COVER CROP.

On September 30 clover was sown on another portion of the corn ground. Likewise it made a splendid growth. The alternate freezing and thawing in early spring will demonstrate the usefulness of this crop as a cover crop. On former occasions the writer has not had marked success with clover sown in corn just previous to the last cultivation. The young plants could not withstand the changeable conditions of early spring, and seemed to succumb to the alternate freezing and thawing. This season the crop did not winter-kill, and an excellent stand was procured.

DRAINAGE WORK.

A system of drains started on a five acre field in 1913 was completed during the early part of the spring. The main drain was extended and all the laterals put in. As was mentioned in a previous report, the present outlet for this system of drains is two deep cement curbed sand traps, the bottom of which is a coarse gray sand which is in itself a porous filter. During recent heavy rainfalls and thaws in February and March, the water which heretofore lay in the low-lying basins of the field rapidly disappeared. Since putting in this system of drainage we have had ample proof that the sand traps are taking care of the drainage water, thus overcoming the collection of water in the basins and the drowning of crops experienced in former years. We had an excellent crop of tobacco on the drained area.

PLANT BED EXPERIMENTS.

Plant beds were established according to the following methods:

1. Cold bed with glass covering, ordinary sandy soil manured.
2. Cold bed with glass covering with a thin layer of black virgin soil applied and fertilized.
3. Cold bed glass covering, open bottom, straw and fodder below, with a thin layer of black virgin soil applied and fertilized.
4. Cold bed cotton covering, sandy soil manured and fertilized.
5. Hot bed cotton covering ordinary gray sandy soil manured.

BRIGHT TOBACCO BEDS.

On April 17 and 18 the following varieties of the flue cured type were sown with slightly swollen seed:—

1. Erzegovine Stolak.
2. Virginia x Erzegovine Giant.
3. Erzegovine Giant.
4. Virginia x Erzegovine x Virginia
5. Yellow Pryor.
6. White Stem Oronoko.
7. Abcock.
8. Warne.

All of the above varieties showed good germination with the exception of the Abcock which was almost a failure.

The above beds were fertilized at 1/10 of a pound per square foot, with the single fertilizers, sulphate of potash, superphosphate and nitrate of soda mixed in equal proportions by weight. Black soil was applied to the ordinary soil, the fertilizer added to the top layer and raked in lightly. The soil was made firm with a plank after sowing.

The seed came up uniformly and made a good growth, plants were ready for transplanting June 1. The seedlings of the Virginia type varieties, the first four names mentioned above, are easily grown. The stand was a little thin on the Warne beds but the plants were of the large, strong, stocky type. The thinner seeding invariably gives the best type of plant to start in the field and withstand the intense heat which sometimes occurs at planting time.

BURLEY BEDS.

The Improved White Burley seed of our own selection was sown under glass in a cold bed the soil of which was treated and fertilized as for the bright tobacco beds. Germination was slow but after the plant got started this variety made a good showing. On April 20th the following varieties or strains of Burley obtained from the Kentucky Experiment Station were sown.

1. Pointed Leaf White Burley.
2. Station Standup Burley.
3. Broad Leaf White Burley.
4. Broad Leaf Standup Burley.

The soil on which this seed was sown had previously grown Warne and Burley plants for 3 years in succession, black virgin soil being added to it on two occasions. In 1913 the plants on this ground were almost a failure being badly affected with bed-root rot. However, the soil was a friable, dark, rich, sandy loam—an ideal plant bed ground. Being advised that if it were treated thoroughly, it would produce good Burley plants, the writer had the ground sterilized before sowing the seed. The result was some of our very best Burley seedlings were grown on this area. The disease was overcome and the weed seeds were killed by the sterilizing. Had the bed area not been treated, as was a small portion in one end of the bed, the plants would have been a failure as was shown by this untreated section.

Conclusions from Plant Bed Experiments.

1. A combination of the single fertilizers nitrate of soda, sulphate of potash and superphosphate mixed in equal proportions by weight and applied at the rate of 1/10 of a pound per square foot gave excellent results as a plant bed fertilizer. As a safe-

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guard against burning the young germ, should sprouted seed be used, the writer would recommend applying the soda say 3 or 4 days before sowing the beds.

2. The practice of sowing Burley beds on the same area for more than one or two years is a risky one unless the soil has been changed or sterilized.

3. As in former years the cold bed glass covering gave plants about 10 days earlier than the cold bed with cotton covering.

DISINFECTION TO OVERCOME THE "ROOT ROT," "THIELAVIA BASICOLA."

STEAM STERILIZATION.

Some 2,000 square feet of bed area was disinfected on April 16 and 17, primarily to overcome the effects of the "root rot." The result was all weed seeds were killed at the higher temperatures, and very slight traces of the disease were noticeable, in any of the beds. It was noted that while the plants did not start quite so quickly the first 10 days, the latter growth was much more rapid than on unsteamed soil.

Method of Treatment.—The soil to be steamed was gotten ready. An ordinary steam engine was used to furnish the steam. Connections were made between the engine and the pan by means of short pieces of rubber hose and the necessary lengths of ordinary galvanized piping. The pan used was 12 feet long, 6 feet wide and 8 inches in depth. It was made of heavy gauge galvanized iron securely fastened to a light wooden framework. Two handles were riveted to each side for convenience in handling. A small piece of ¾-inch pipe in one corner of the pan, served as a steam inlet.

The pan was inverted over the bed and the edges pressed into the soil so that no steam could escape. The steam was turned into the pan for 30 minutes at 100 pounds pressure. The pan was then placed on the next section to be treated and the operation repeated. In this way nearly 1,200 square feet may be treated in one day. Precaution was taken not to introduce any unsteamed soil into the beds.

ADVANTAGES OF STERILIZING BEDS.

1. The killing of all weed seeds, disease and insect pests.
2. The increased earliness, vigour and uniformity of production of plants.
3. The cost of weeding beds is reduced to a minimum.

Recommendation.—In case a grower feels he does not wish to invest in a pan a few growers might easily co-operate in having a steaming pan made and in renting a steam engine.

Tests in steaming beds for varying lengths of time:

1	section	20	minutes	at	100	pounds pressure.
1	"	30	"	"	100	" "
1	"	40	"	"	100	" "
1	"	60	"	"	100	" "

There was no appreciable difference in the growth of the seedlings in the different sections. The area which was treated for 60 minutes did not give any better seedlings than that portion treated for 20 minutes. Judging from one year's experience, if the pressure is carried at 110 to 120 pounds for 20 minutes the results are satisfactory. However, generally speaking to get effective and safe results it is preferable to treat for 30 minutes at 100 pounds, particularly if you are using but one pan, and moving it immediately with each change of operation.

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FORMALIN TREATMENT FOR OVERCOMING THE PLANT BED DISEASES.

The soil was first removed to a depth of 6 inches, straw and coarse fodder was tramped in and the soil replaced. A formalin solution was made of 4 pounds formalin in 2 barrels of water. This quantity was used on 140 square feet of bed area. The solution was applied in two applications. Old sacks were spread on the treated soil to prevent the escape of the fumes, and the sash also placed on the frames. Swollen seed was sown on this treated area April 23. The plants came up more rapidly than on steamed soil. They made a rapid growth up till the time of transplanting June 15, when the leaves started to turn yellow, and the plant itself seemed to be starving for nourishment. On examination it was found that the roots of many of the seedlings had turned dark and the young fibrous root hairs were not developed, a clear indication of bed root rot. Evidently the treatment using this strength of formalin solution was not a success. Possibly the solution was not of a sufficient strength to be effective. The writer noted that the weed seeds germinated very readily on this area; and it was necessary to weed the beds three times to give the plants a chance to grow.

IDENTIFICATION OF THE BED-ROOT ROT.

The top growth of the plant remains at a standstill. In some cases the seedlings, particularly those of the Burley variety, present a sickly yellow appearance. The bright and dark types of tobacco, for example, Warne, Yellow Pryor and Connecticut Seed Leaf, do not show this yellow, unnourished appearance. The leaf of the seedling maintains its green cast, but the plant stands still.

Upon examining the roots of either of the above mentioned types, it will be found that the root system is not developed, particularly there is an absence of the ramification of the fine rootlets. Further the ends of the main roots and even the extremities of the fine root hairs present a dark, dead appearance as though they had been burned. The writer has found many beds affected with this disease and the grower could not understand the cause why his plants were not doing well.

Recommendation.—The writer would highly recommend the steam treatment of beds as mentioned above as a safe means of overcoming this disease in the beds. If your plants are perfectly healthy when transplanted you are not so likely to transmit the disease from the bed to the healthy soil of the field. Undoubtedly this bed-root rot, as we find it so prevalent in tobacco fields of this county, originated in the plant bed.

TOBACCO ROOT-ROT OBSERVATIONS.

In 1913 we had a two acre plot of Burley which made an uneven growth; it might be termed a partially Burley sick soil. The observations the writer made in the field were as follows: Plants on certain rows in the plot seemed to have stopped growing. The dwarfed plants were often attacked by the mosiac disease; but sometimes the stunted or dwarfed plants bore no traces of this mottled appearance, but simply seemed to have stopped development.

This latter case applies to fields the soil of which was still healthy at planting time, but the diseased plants have been taken from the diseased plant bed. But in the more exaggerated cases in other fields in the county the writer has noticed whole fields which presented an uneven, dwarfed appearance, in which case the disease has been prevalent in the field and has affected previous crops but was unrecognized.

The writer considers that in the case in question on the farm at Harrow the disease was transmitted from the infected plant bed to the field. The root system of many plants were so seriously affected that the feeding powers of the fine root hairs were cut off so completely that the plant was merely surviving on a limited supply of plant food.

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Undoubtedly this disease has been prevalent in many fields which have been closely cropped with Burley but it has never been recognized. One must admit that a case is somewhat difficult to diagnose unless you are thoroughly acquainted with the symptoms. The grower should feel at liberty to send any diseased specimens to H. T. Güssow, Dominion Botanist, Central Experimental Farm, Ottawa, for identification.

The situation is not improving and if we were to study the facts as expressed by many growers, "My ground is Burley sick. I shall have to grow a crop which is easier on the soil," we should find in many cases, that the soil was infected with the "Root Rot." We might substitute for the Burley other varieties of smoking tobacco as Connecticut Seed Leaf, Big Ohio, Golden Seal, Comstock Spanish, which are more resistant. However the market for such varieties is not favourable, and even these kinds become badly affected.

It is believed that through a process of selection and breeding a disease resistant strain can be worked out.

PRECAUTIONARY MEASURES.

The soil of the seed bed which produced sick plants in 1914 must be either discarded or steamed for 20 to 30 minutes with pressure at 100 pounds. To treat the bed area secure a pan the width of your beds 8 to 12 feet long and about 8 inches deep. A serviceable and inexpensive pan can be made by securely nailing galvanized roofing to four pieces of 2-inch x 4-inch oak scantling and soldering the seams so no steam may escape. Have an intake in the form of a short piece of galvanized pipe securely fastened in one corner of the scantling frame. One handle on each side of the pan would make it more convenient to handle.

The writer saw some beds last spring which were prepared and cared for alike. Part of the bed area was disinfected with steam and a portion left not treated. At the time of my visit there was at least 3 weeks difference in the growth of the plants. In short the untreated portion gave promise of being a failure, while the treated area was producing healthy seedlings with very little work required in weeding the beds.

Adopt a longer rotation, say corn, cereals, clover, followed twice in succession before planting Burley on the soil. The above precaution applies particularly to an area of ground which has been frequently used for Burley tobacco.

Let the farmer consider as diseased a field on which a very uneven growth of tobacco was observed in 1914, and be convinced that growing tobacco continuously on the same soil is a risky and exhaustive practice.

FIELD EXPERIMENTS WITH FLUE-CURED TOBACCO.

Five acres of flue-cured leaf were planted from June 3 to June 13.

The ground was treated as follows: A 2 acre plot was given an application of:—

300 pounds superphosphate per acre.
300 pounds sulphate of potash per acre.

A 3 acre plot was fertilized at the rate of:—

300 pounds superphosphate per acre.
200 pounds sulphate of potash per acre.

The fertilizer was harrowed in just before the ground was rolled and planting commenced.

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The object of applying this fertilizer was to hasten the growth but more particularly to aid in maturing the crop earlier in the season during the hot dry weather in August. It tends to brighten the colour because of its decided effect in ripening the leaf.

The above area was planted quite close, 3 feet by 21 inches. The object of the closer planting was to grow a smaller plant and by so doing to get a smaller, thinner leaf of brighter colour. The writer would say that the object was attained to a large degree. The percentage of bright red and bright leaf was greater than in former seasons although the crop had been grown on the same soil for 3 years previously. Particularly was this statement true of the Warne variety.

The following varieties of flue-cured tobacco were tested on the above mentioned 3-acre plot:—

8 rows Erzegovine Stolak, planted June 3.
10 rows Virginia x Erzegovine, planted June 3.
9 rows (½ acre) Yellow Pryor, planted June 11.
9 rows (½ acre) White Stem Oronoko, planted June 11.
9 rows (½ acre) Virginia x Erzegovine x Virginia, planted June 11.
9 rows (½ acre) Erzegovine Giant, planted June 12.
2 acres Warne, planted June 12.

COMMENTS.

The two varieties Erzegovine Stolak and Virginia x Erzegovine of the first planting made a very rapid growth and were ready for harvesting at least fifteen days before any of the other varieties.

Harvesting was commenced August 27, and these two varieties were a little overripe even at this date, the leaf showing up fairly yellow in the field. However, after curing the colour was not as good as was expected. There was a small percentage of the bright grade. In texture the leaf was very thin and light; it was lacking in body and character. The aroma of these varieties was good.

Considering our particular conditions of soil and climate the Yellow Pryor and the White Stem Oronoko are two very good varieties for flue curing. The Yellow Pryor does not differ much from the Warne in habit of growth and in the length of time required for maturing. The White Stem Oronoko, a smaller growing variety than the Yellow Pryor or Warne, gave a small leaf, but the colour, texture and character of leaf were very fair. These two kinds are slower growing and require much more time to mature than any of the Italian types. The Virginia x Erzegovine x Virginia gave a rather coarse textured leaf, with only a small percentage of the bright grade. The Erzegovine Giant cured up a good colour. There was quite a large percentage of the really bright shade in this variety. The leaf was light in weight and thin in body.

The Warne cured up a brighter colour than in previous years, presenting a leaf of strong body and fine texture. The soil, while not of an ideal bright tobacco type, is becoming depleted in nitrogen and better adapted for the growing of Warne. Our soil contains too large a percentage of clay for best results.

Another two-acre plot of bright leaf was planted on ground that had previously been cropped with barley. One acre was fertilized with 500 pounds of superphosphate while the other acre received no chemical manure. The application of fertilizer was given to aid in the quicker maturing and yellowing of the leaf.

The acre plot not fertilized was planted in Warne. The crop grew quite dark and rank, an indication of too much nitrogen for this type of leaf. The writer believes that where there is a tendency for the plant to grow too large and rough, that closer

planting and quite high topping would give better results. This conclusion is drawn from the past six years' experience with bright tobaccos on a sandy soil with quite a percentage of clay in it. By so doing you will not likely produce such a thick, heavy, oily leaf, what the manufacturer terms "rough."

The other acre fertilized with superphosphate was planted in Virginia x Erzegovine x Virginia. While this variety matured about a week earlier than the Warne, the colour was not as bright as in those varieties of the Italian type mentioned above.

Immediately after planting the 7 acres the poisoned bran mash was applied around the plants. This remedy greatly checked the ravages of the cutworm. By subsequent replanting a very uniform stand was obtained. The entire crop made splendid progress during the latter part of June and July, and was undoubtedly the most uniform field of flue-cured leaf yet grown on the Station. Topping was commenced July 27.

Practically all of the bright leaf was sprayed, using a power sprayer, putting on 4 pounds of lead arsenate to 80 gallons of water. Where the worms were not too large this strength of solution did very effective work. When the grower has a large area, say fifteen to twenty-five acres, the writer believes a power sprayer is a good investment. This machine will do very thorough work, reaching the leaves from above and also from below, throwing an even fine spray to almost all parts of the plant. To obtain the most effective results the crop should be sprayed when the plants are comparatively small and the worms are first noticed. Later on a second spraying should be given using a hand duster and Paris green on the finely powdered lead arsenate. The last application should be given when the tobacco is too large to allow the power sprayer to pass up and down the rows without tearing or breaking the leaves.

However, one spraying would be sufficient if the grower has a small flock of ducks to put in the patch, later on in the season after the poison has lost its insecticidal value. The writer has found that while the ducks do good work, there is a liability of putting too much dependence upon them. Certain parts of a large field where the worms might be very prevalent they sometimes miss.

For a small acreage the writer has found that ducks or turkeys will do very thorough work, and spraying would not be necessary.

CURING.

The curing process was conducted according to the methods outlined in previous reports. It was thought that there was not sufficient ventilation in the kilns to properly carry on the curing process. Large ventilators were made in the ridge board of the roof of each kiln. When these ventilators are completed they will be under the perfect control of the man in charge of the curing, and, should a superabundance of moisture occur at any period of the curing process, by increasing the temperature and opening the ventilators the excess may be eliminated.

It is true that through this ventilating system a greater air circulation resulted and the surplus moisture was carried off more easily; but, it is doubtful if any particular advantage in getting a brighter colour of leaf, was attained. However, a more complete series of tests should be carried out before any definite conclusions are arrived at.

GRADING.

The entire crop was sorted into the following grades: Bright Leaf, Bright Red, Dark Red, Tips and Sand Leaves or Lugs. Each grade was put in a separate bale, and a label attached to each specifying the variety, the grade, the weight and the designation of Harrow Experimental Station. Thus the manufacturer has complete information as to what he is getting. The leaf was not put up in hands as in former years but rather the loose leaf system was adopted. Each bale was wrapped in paper to prevent breaking.

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FERTILIZER EXPERIMENTS WITH BURLEY.

The Burley ground was prepared from a clover sod manured at 16 spreader loads per acre, and fertilized according to the outline below. Part of the area was manured the fall and summer previous while the balance of the ground was covered during the winter and early spring. Ploughing was finished the first week in June, and the ground was immediately rolled and double disced. It was again disced, harrowed smooth and fertilized. The fertilizer was harrowed in and the ground rolled before planting.

Fertilizers were applied as follows:—

Plot 1.—Acre plot—
- 250 pounds nitrate of soda per acre.
- 300 " sulphate of potash per acre.
- 300 " superphosphate per acre.

Plot 2.—Acre plot—
- 200 pounds sulphate of potash per acre.
- 400 " superphosphate per acre.
- 500 " nitrate of soda.

Plot 3.—Acre plot—
- 400 pounds basic slag per acre.
- 200 " sulphate of potash.
- 250 " nitrate of soda.

Plot 4.—Acre plot—
- 300 pounds superphosphate per acre.
- 300 " sulphate of potash per acre.

COMMENTS.

All the above plots were planted June 4 and 5 at 3½ feet by 32 inches in the row. A good stand was obtained as the weather was cool and fairly moist. However the cutworms were quite numerous and would have done considerable damage had we not used the poisoned bran mash around the plants. By resetting almost a perfect stand was obtained over this area.

The crop made a good growth up till the fore part of August. During the first two weeks of this month dry, cool weather prevailed. The result was this 4-acre plot of Burley took on a marked yellow appearance, particularly was it noticeable in the bottom leaves of the plant. The yellowing was soon followed by a firing. There was an abundance of plants on the higher dry sand, which had four to five bottom leaves badly damaged, practically wasted away. The crop had reached such a stage of development that it did not recover from the effects of the prolonged drouth. The yields were consequently greatly diminished.

Plot 1.—Bordering on a long row of large maple trees, which drew considerable moisture and nourishment from the outside rows, yielded 950 pounds per acre.

Plot 2.—Receiving the heavy application of nitrate of soda yielded 1,077 pounds per acre.

Plot 3.—1,050 pounds per acre and plot 4, 988 pounds per acre. These are comparatively low yields.

The writer attributes the results to the very early planting and the drouth which happened to strike the crop just when it would have made the best progress. Then again quite low topping was practised on these plots, many plants having but 6 to 10 leaves. As a test the stalks were split in Nos. 2 and 3; but there was no appreciable difference in the colour of the leaf or in the thoroughness of curing.

The harvesting of the above area was completed September 5. The seedlings used in the planting were healthy coming from sterilized beds. The writer did not find root rot to be prevalent in field conditions, hence the reason for stating that transplanting was rather early for the 1914 season.

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QUANTITATIVE TESTS OF FERTILIZERS.

An area of $2\frac{1}{16}$ acres was ploughed out of clover sod manured at 15 tons per acre and fertilized as follows, each plot containing one-sixth of an acre.

—	Kind of Fertilizer.	No. of Plot	No. of Plot.	No. of Plot.	No. of Plot.	No. of Plot.	Yields in Lb. per Acre.
			1	2	3		
Nitrogen Plots..	Nitrate of Soda..........	......	240	320	480	1	1,758
	Sulphate of Potash	......	300	300	300	2	1,566
	Superphosphate..........	......	200	200	200	3	1,713
			4	5	6		
Potash Plots....	Nitrate of Soda..........	......	400	400	400	4	1,650
	Sulphate of Potash	......	180	240	360	5	1,902
	Superphosphate..........	......	200	200	200	6	1,962
			7	8	9		
Superphosphate Plots.	Nitrate of Soda..........	......	400	400	400	7	1,980
	Sulphate of Potash	......	300	300	300	8	1,905
	Superphosphate..........	......	120	160	240	9	1,950
		13	10	11	12		
General Formula	Nitrate of Soda..........	400	240	320	480	10	1,956
	Sulphate of Potash	300	180	240	360	11	1,917
	Superphosphate..........	200	120	160	240	12	1,779
						13	1,884

Number of Plot.	Cost of Fertilizer (Acre basis).	Value of Crop (Acre basis).	Net return per Acre.
	$	$	$
1..........	15·80	210·96	195·16
2..........	17·90	187·92	170·02
3..........	20·30	205·56	185·26
4..........	17·10	198·00	180·90
5..........	18·60	228·24	209·64
6..........	21·60	235·44	213·84
7..........	19·46	237·60	218·14
8..........	19·78	228·60	208·82
9..........	20·42	234·00	213·58
10..........	12·16	234·72	222·56
11..........	16·08	230·04	213·96
12..........	22·12	213·48	191·36
13..........	20·10	226·08	205·98

Comments.—The fertilizer cost was based on the market prices paid in 1914. The value of the crop was considered at 12 cents per pound, the market price obtained.

The object of the test was to find out the amounts of sulphate of potash, nitrate of soda and superphosphate to apply per acre to give the largest net returns. A conclusory statement cannot be made from a single test carried on during one particular season. A series of tests will be required before a definite and accurate conclusion can be arrived at.

VARIETY TESTS OF BURLEY.

The following varieties of Burley were tested. The ground on which they were tried was a clover sod fertilized with 400 pounds basic slag and 200 pounds of potash per acre:—

No. 1. Broad Leaf Standup Burley.
No. 2. Station Standup Burley.
No. 3. Pointed Leaf White Burley.
No. 4. Broad Leaf White Burley.

Comments.—The above strains were obtained from the Kentucky Experiment Station.

The Broad Leaf Standup Burley was a large growing, broad leafed type yielding 1,800 pounds per acre. The habit of growth was similar to that of the Improved White Burley which has been grown on the Station for several years.

The Station Standup was a smaller growing type. The leaves were not so broad and were more pointed and erect. The yield was 1,600 pounds per acre. The pointed leaf strain has a pronounced pointed leaf. The habit of growth was somewhat similar to the Station Standup. The yield was 1,650 pounds per acre.

The Broad Leaf White Burley had a pronounced broad leaf in comparison to the length of same. This was a rather coarse growing variety, the mid rib of the leaf being quite prominent. The yield was 1,950 pounds per acre.

EXPERIMENT IN SCAFFOLDING WHITE BURLEY.

One acre of Improved White Burley was fertilized with 300 pounds superphosphate and 200 pounds sulphate of potash per acre. One-half of the plot was set at 3½ feet by 21 inches, the balance was planted at 3½ feet by 28 inches.

The entire acre was put on the movable scaffolding on September 19 and hauled in from the scaffold on September 30. The early part of the fall was favourable for curing, and at stripping time no apparent difference in the colour of the leaf was noted. It is true that the leaf changed from the yellow to the reddish tinge a little more quickly on the scaffold as compared with that hanging in the barn.

Judging from one year's experience in scaffolding White Burley, the particular advantage of the practice is: with a large crop and a limited barn space, scaffolding for two or three weeks will permit of closer hanging in the curing barn without danger of "barn burning."

HARROW.

TOBACCO INSPECTION WORK IN ONTARIO FOR 1915.

G. C. ROUTT, INSPECTOR.

My work as tobacco inspector for the province of Ontario began in April, 1914. After spending the month of April in Ottawa where I received instructions from Chief Charlan, Head of the Division, I left May 1 for Kingsville, temporary headquarters for the summer.

Soon after locating at Kingsville I got in touch with some of the growers and buyers. There was a great deal of dissatisfaction among the growers on account of the very unsatisfactory prices received for the 1913 crop, and many had decided to discontinue the growing entirely, or at least decrease their acreage much below that of previous years. I found that many farmers had their 1913 crop still on hand, the buyers claiming that it was too inferior for them to handle since they were overstocked with such grades. I inspected several crops in various localities of Essex and Kent counties and found these statements quite true. The percentage of inferior leaf in the 1913 crop was very large and no doubt was due, in a large measure, to unfavourable weather conditions both while the tobacco was in the field and curing shed. These conditions were brought about to a large extent by the very dry weather during the growing season which retarded the growth and ripening of the tobacco, also by the early frost which caught a number of crops before they were cut. These conditions were further affected by the cold muggy weather which was very unfavourable for proper curing after the tobacco was put into the barns. Such conditions can be avoided to a large extent by earlier transplanting and the use of artificial heat in the curing barns, especially during these damp muggy periods. The average grower does not fully realize the necessity of avoiding these difficulties as well as he should. By transplanting at the earliest possible period the tobacco will mature for cutting much earlier in the season which will mean a longer period of favourable weather for curing besides practically eliminating the chances of the crop being damaged in the field by early frosts and freezes. Some growers are not in favour of early transplanting, claiming that the tobacco does not yield the weight which later planting does. This is probably true in a sense, but the reasons are quite evident, because the late crop, aside from being frosted or frozen, in many cases does not have favourable weather for curing out properly and always contains a very high percentage of moisture. One can readily see that when he considers the qualities of the early and late crops there is no comparison. The early crop will practically be free from all the objectionable features, such as frozen, dark and useless leaves, fat stems, and many other unsatisfactory points. Moreover the early crop, besides being freer from the objectionable features of the late, will contain a fair percentage of fairly bright leaf which is much in demand by the Canadian manufacturer. The crop in general will be much better and there is a strong demand for the grades of better quality. The manufacturers are overstocked with the more common grades of tobacco, but are always ready to buy the best grades at a good price. Anything that will approximate in colour, texture and quality some of the grades that are bought and imported from the States would be readily bought up at a good price. This is quite evident when we consider the duty of 28 cents per pound on all foreign leaf. If grades possessing these qualities can be produced in Ontario one can readily see they would be bought by the Canadian manufacturers instead of importing, thus saving the duty, which would lower the initial cost.

When Canadian growers realize these possibilities and advantages, then steps will be taken to carry them out to the highest stages of perfection.

Since there is very little Canadian leaf exported the production should be kept in close range to the consumption. It is quite evident if there is an overproduction that this will in itself lower the prices.

It would be well for the grower to bear in mind that quality is more important than quantity and spare neither time nor patience to accomplish this end. It is more profitable to produce from 1,200 to 1,500 pounds of tobacco per acre at 12 to 14 cents per pound than to produce 2,000 pounds per acre at 7 cents per pound. Aside from the increased net returns from the crop it requires less labour to handle the smaller crop which in turn does not draw so heavily on the land, thus depriving it of less fertility.

There are wonderfully good opportunities for the grower who will take all precautions to produce the best grades of tobacco, in short, the grades in most demand by the manufacturer. These are the growers who will have no trouble to sell their crop readily at fancy prices.

The growers in general do not pay the proper attention to the growing of plants sufficient for the acreage they attempt to transplant. On the whole the main points at issue are given very little consideration and as a rule poor results are obtained. In the first place we should advocate the adoption of tight wooden frames and glass sashes for the plant beds. This will require a somewhat larger outlay in the way of initial expenses for the proper equipment than where the ordinary frames and canvas is used, but the advantages to be gained would more than repay in the way of better and much earlier plants. There is also an extra saving, for the life of ordinary canvas is only one or two years while glass sashes, when properly cared for, will last many years, so the expense in the long run would be no more. It would be wise to sow at least twice the necessary bed space required for the acreage intended, and some of the beds should be sown at different periods which would act as a safeguard in case the early plants were injured by late freezes.

Few growers practice fall ploughing of their tobacco land which would help eradicate the ravages of the cutworm after transplanting, besides it could be properly prepared for transplanting earlier in the spring. The loss caused from cutworms last year was rather large for there were few crops both early and late that were not molested throughout the whole tobacco districts of Ontario.

It would probably be well to apply manure in the fall, either before or after ploughing, depending on the nature of the soil; however, in case the soil is very porous and sandy it might be well not to apply manure before spring, principally to land on which Burley or some of the dark types of tobacco are to be grown the same year. Some growers object to applying manure in the fall, claiming that the winter and early spring rains leach out the fertility, especially the nitrogen, but this should be the case only on the very porous sandy soils. The most evident advantages of applying in the fall are that the manure would be thoroughly rotted and that the elements of fertility are immediately available soon after transplanting which would cause a rapid growth and quicker maturity. On the other hand, if not applied until late spring, the fertility, especially the nitrogen, would not be available until comparatively late in the growing season which would prolong the growth at the time it should be ripening, thus causing a heavy dark plant; besides, the green manure might injure the young plants by excessive heating of the soil from fermentation or chemical changes aside from a possible injury due to fungous diseases. The colour of the leaf, especially the Burley, would be improved by the fall application. I believe it would materially increase the percentage of bright or lug leaves.

It would be a good policy to refit the land and have it in good shape for transplanting at the earliest possible date in the spring. It is better, if plants are plentiful to run the risk of injury by frost in the early spring when the plants are small than to have the crop damaged by frost or freezes in the fall because it was too late. There

is certainly less at stake in the former case besides there is less danger of the early crop being injured than the late. It should be transplanted the first week in June, especially the Burley and flue-cured types, since they require a long time for maturing and should be harvested riper than the darker types with the exception of snuff.

As a rule most growers cultivate their tobacco fairly well, but it might be worth while to insist upon a somewhat deeper cultivation at first, especially if the land has not been thoroughly prepared, gradually becoming more shallow as the root systems develop.

One or two hoeings should be sufficient if the cultivator is properly handled. Cultivation should begin as soon as the plants have started to grow and be continued every 8 or 10 days until the plants become so large that injury in the way of broken leaves results from the operation. Tobacco can be cultivated until almost ready to top by using a very short single tree and greasing the legs of the horse and traces.

Many growers are inclined to top too high, and too late, thus delaying the operation longer than need be in order to secure more leaves which causes the crop to be much later in maturing and lowers the quality of the leaf. On account of the shorter season it would probably be well to top the Canadian Burley on an average of two leaves lower than the average topping for Kentucky. These conditions would be modified by types of soil and vigour of plants.

It would be well to insist on the growers removing the suckers before they are too large, depriving the leaves of nourishment and delaying the period of maturity. Some growers are of the opinion that by allowing the suckers to grow rather large, the qualities of the leaf are improved. This may be true in a way, under certain conditions, but on the whole, far greater damage results in the way of reduction in yield, broken leaves and delayed maturity, overcoming any good that may be apparent.

As a rule the grower does not prevent the horn-worm from damaging the crop as much as he should. I heard several buyers complain of the damages from this source last season.

I believe that Paris green applied, at the rate of half to 1 pound per acre, every 2 weeks, from the middle of July until within 2 or 3 weeks of harvest, would aid much in controlling this pest. Of course, hand picking should be practised also to get rid of the large worms that are not killed by the poison. The first and second broods occur in greatest numbers between the middle and latter part of July and August respectively or it would probably be safer to say about the light of the moon in these months, for the tobacco hawk or moth is very busy during the light nights depositing eggs on the tobacco. If the Paris green is applied before these periods the greater portion of the worms are killed while quite small before any damage is done. A fairly good blow-gun for applying the dry Paris green can be purchased for from $2 to $10. The best I know is made by Leggett and Bro. New York City, and will cost about $10 laid down in Canada.

HARVEST, HOUSING AND CURING.

The average tobacco grower damages his crop quite materially during these operations. In fact buyers say that it is quite common to find crops of good quality while growing in the field rendered almost useless by damage received during harvest and housing. The principal injuries incurred during harvest are torn and bruised leaves, injury by dirt and sand adhering to the leaves, also by a small percentage of sun-burn. The bruised and torn leaves are principally due to rough handling, and to poorly equipped frames for hauling from field to barn. A great many growers are too hasty and don't take the necessary pains with the crop to secure best results. The dirt and sand on the tobacco is gotten either by cutting while there is a heavy dew on the tobacco or allowing it to lay in piles on the ground to take the rain. These are unpardonable practices which are quite common and should be discontinued if the

best results are to be obtained. This can be largely overcome by starting to cut after the dew has dried off of the tobacco and placing the plants, with the stalks split, astride sticks driven in the ground at an angle of about 65 degrees. This will keep the plants off the ground thus practically eliminating the dirt besides shortening the operation because the plants are not handled so many times as when cut, piled and speared in the old way. I believe the percentage of bruised and torn leaves would be lessened in handling this way, since the operation is shortened and the percentage of broken leaves should be about the same. If handled in this way, splitting the stalks would be imperative, aside from being an essential aid for proper curing.

The curing barns in some localities are very good while in others quite poor. The percentage of house or pole burned tobacco in some sections is quite large, especially where the barns are poorly ventilated. These conditions are also produced by crowding or hanging too close in the barn caused in many cases from lack of barn room to accommodate the acreage devoted to tobacco. The growers, stimulated by the rather high prices received for previous small crops and endeavouring to get rich off the next crop, put out an acreage which surpasses the capacities of their barns and the ultimate result is a crop of inferior house-burned tobacco which is sold at a loss instead of a profit, as was the case of smaller crops that were handled with more care. Where tobacco is cut and housed the same day or the day after, it would be well to hang the sticks from 10 to 12 inches apart on the tier poles. It is safer to hang a bit too wide and rehang closer after partly cured than to hang too closely and have the crop damaged by house firing. If the weather should continue damp and muggy for some time after the tobacco is housed it would be advantageous to apply artificial heat in some way to aid the curing. This can probably best be accomplished by building a large number of small charcoal fires at regular intervals under the tobacco. By raising the temperature of the air the capacity for holding moisture is also increased and as moist air is lighter than dry air at the same temperature it will rise and give place to the latter, which, in turn will take up more moisture and will rise, thus setting up a circulation of air through the tobacco. The heat should be sufficient to warm the air throughout the barn, for, in case it is not, the warm air, when it comes in contact with colder tobacco in the upper tiers of the barn, would deposit moisture, thus aggravating instead of improving the conditions. Tobacco does not necessarily have to be crowded in the barn to cause house-burn. If the atmosphere in the barn is very humid and warm for several days these conditions will produce it if there are only a few sticks of tobacco in the barn. The organisms that produce house-burn flourish best, provided conditions are favourable, while the tobacco is in the latter stages of yellowing, and, for this reason, many growers think their tobacco is out of danger, when, in fact, the conditions are probably more ideal for its development than at a somewhat earlier period when house-burn is expected by the grower. I believe that there are great possibilities to facilitate air curing in the future; by applying artificial heat, I believe it will do much to improve the quality of the tobacco in general, especially the later crops which are more apt to encounter unfavourable curing weather. It will do much towards eradicating "fat stems," "mouldy," "house-burned" and very dark and off-coloured tobacco, which means that the crop would be more uniform and brighter in colour. Since the bright grades are very much in demand, this means a more ready sale and better prices. By the use of artificial heat to hasten the latter stages of curing, the grower will be able to strip and sell his crop at an earlier date than in the past. The damage from mouldy tobacco was rather large in some localities last year. It appeared to be worse in old open barns where the ground underneath the tobacco was very damp. I think the source of infection is carried over from one year to the other by allowing the refuse from previous crops, such as stalks and trashy tobacco, to remain in the barn. The dry spores of the fungi which cause the mould are scattered throughout the barn and

when conditions are favourable they develop on the crop after it is hung therein. If the farmer would remove all stalks and rubbish from the barn soon after stripping the crop and spray the barn and floor with some good fungicide, much of the damage from this source would be checked. The use of artificial heat in curing would also aid in checking the development of the mould.

STRIPPING AND GRADING.

These are very important phases of the work, but very few of the growers want to grade their tobacco at all. They consider it an extra task for which they receive no extra compensation. The majority strip it off and tie it all up together into very unsightly hands. The sooner they realize the benefits for grading into at least 3 or 4 grades, the better, for then both buyer and producer can see the crop to the best advantage, and the prices can be offered according to the grade and quality. In this way it can be sold to the best advantages of both parties. No doubt if a good loose-leaf market could be established it would do much to educate the grower along these lines, besides, it would eliminate many personal difficulties between the grower and buyer. Of course, a market has some unsatisfactory points, for it is cheaper for the grower to sell his crop in the barn provided he could receive the same prices as on the market. The main feature that stands in the way of a market is the lack of competition in buying, but I believe this would improve with time. The buyers could pick the grades that they needed from time to time without buying the whole crop, by which in many cases at present, they are forced to take over much tobacco of an inferior quality. If a good tobacco show or exposition could be established at Harrow this would help to accomplish this end This work could be facilitated by small exhibits at the country fairs in the tobacco districts.

On account of the increased consumption, due largely to a growing population, I feel that the tobacco industry in Canada has a bright outlook. As the quality of the crop in general is improved, "Canadian leaf" will gradually supplant many grades of the various types of imported leaf thus affording a larger demand and higher prices.

It might be well to say a few words on the soils and conditions in general of different localities in the tobacco districts of Ontario.

Essex County.—The greater portion of the tobacco produced in Essex is grown in the central and southern part of the county. This is probably due to the character of the soil, which is a sandy loam. There is some tobacco grown on the heavier clay and clay loam soils in the northern and western parts of the county. Most of the soils in the tobacco sections are rather run down for tobacco, in a large measure from lack of rotation, while some, especially clay soils, are, pretty well infested with the fungus producing "root rot." A great many types and varieties of tobacco are produced in Essex. On the heavier soils in the northern and western parts, Seed Leaf, Comstock, Green River Snuff and varieties of dark tobacco are produced. Some dark tobacco is produced between Kingsville and Harrow, principally the variety known as "Golden Seal" or "Gold Leaf," some few crops of Connecticut Broad Leaf "General Grant," "Zimmer Spanish," etc. In southeastern Essex on the sand and sandy loam soils near Leamington and Ruthven, the different varieties of flue cured tobacco are produced with a fair degree of success. The results the past year were quite satisfactory to both the grower and the buyer and the acreage devoted to this type no doubt will be increased next year. This type of tobacco has a wide demand among the Canadian manufacturers and no doubt its growth will gradually increase on soils that are particularly adapted to it.

The acreage devoted to tobacco was materially decreased last year, but varied with the localities throughout the county. In some localities it was scarcely 25 per cent, while in others more than 75 per cent, a general average for the county being probably

50 per cent. The Essex growers, as a rule, are not over anxious to devote any more time to their tobacco crop than is necessary, and do not get the quality because so many make tobacco secondary to all other crops. The curing barns in general are not so good as in Kent.

Kent County.—While Kent county is newer in tobacco production than Essex, still in some ways I believe it is superior. In the first place, I believe the soil is more fertile, and, in general, better adapted for Burley and other types of air cured tobacco; 2nd, the barns are more modern and better adapted for proper curing; 3rd, the growers as a rule take more pains and care in handling the crop. Of course there are exceptions both ways in each county, but a general summary of all conditions would favour Kent. Like Essex the culture is confined principally to the southern part of the county. The principal centres being Cedar Springs, Blenheim, Chatham, Ridgetown and Highgate. The acreage around the above named places was somewhat reduced last year, but with the exception of Chatham and Highgate was fair, probably 80 per cent of 1913 acreage. However, the acreage south of Blenheim and Ridgetown around Rondeau, Morpeth and Palmyra was decidedly decreased to probably not more than 35 per cent of 1913 crop. It was in this section that a large amount of the 1913 crop was left on the hands of the grower, the manufacturer claiming that it was inferior in quality. The growers in this section tried to form a co-operative association to market their tobacco, and I am afraid that this was considered as an aggressive move from the part of the buyers. Many growers have a tendency to overestimate the value of their crop and very often ask prices that are extortionate for inferior crops. Some buyers claim that this locality is not adapted to tobacco, but I believe that when the crop is properly handled, the quality is about as good as on the ridge around Blenheim, at least I saw some crops the past fall that compared favourably well with the best in other localities. Of course the lighter soils on the ridge are more favourable to grades of brighter colour and finer texture.

The greater portion of tobacco grown in Kent is White Burley, but there was about 190 acres of snuff or fire cured tobacco grown around Blenheim last year.

The tobacco cured out fairly well but I did not see very many extra good crops. Most of the tobacco was rather dark, and some crops were damaged by mould.

The co-operative association which was formed last spring, has its largest membership around Rondeau, Morpeth and Palmyra. There are also growers from various localities in Essex that belong to the association but as a rule there are very few of the best and influential growers in either county that are members. They claim about 1,000,000 pounds of tobacco of both 1913 and 1914 crops under the association. This amount is far too small if they hope to accomplish anything, besides, the tobacco in many cases, is rather poor in quality. It seems to me that it would be well for the growers to try first to produce a better quality, then, if prices do not advance accordingly, a good co-operative movement would be the next step in order. This no doubt would bring results if entered into by a large majority of the growers.

Prince Edward County.—The acreage devoted to tobacco in Prince Edward County was rather small the past year. Quite a number of farmers like to grow tobacco, but, on account of the unsatisfactory prices, and the poor chances of selling their crop, are afraid to take up the culture. The company which had been buying their tobacco up to 1913 for some reason did not take over this crop, so it was bought by another concern. There have been no barns built especially for tobacco, yet the farmers say they would build, should the culture be established sufficiently to warrant it. When I visited Prince Edward county about the 15th of July I found that the tobacco crop was as forward, if not a bit more so, than in Western Ontario. There are soils around Picton that I believe fairly well adapted for the flue cured types, but probably the greater portion is better adapted for Burley. There is quite a bit of limestone in the soil and in some places the underlying strata are almost too close to the surface for proper growth

and cultivation. This is principally true with the rolling and hilly sections. Tobacco is principally grown on the shores of East and West lake. The soil is largely a sandy loam with quite a bit of clay content. There were some fair crops the past year. I believe that the growers in a new locality will make greater efforts to produce the best results, and these are the most essential points, if the quality of the crop is to be improved, provided the soil and weather conditions are favourable. I secured a sample of very bright leaf on my last trip to Picton the latter part of December.

There is a movement on foot to have the farmers in Prince Edward grow tobacco under a three-year contract. They are requested to grade their tobacco into 3 or 4 grades and will receive prices according to the quality.

Pelee Island.—I visited Pelee Island May 15, for the first time and it was very wet on the island, due to the recent rains. The conditions, too, were worse on account of the rather heavy soil which is much inclined to be marshy in localities that have not been properly ditched and drained. The plants were only fair, since practically all were grown under cotton. There was a fair percentage of the 1913 crop left on the hands of the growers but not quite so large as in some localities on the main land.

The barns for housing and curing the crop are in most cases very good. They are better on the average than in Essex county, and, with the exception of some localities, than in Kent county.

The soil, where properly drained, should produce good Burley. In the first place, it appears to be principally a limestone formation, and secondly, the clay content in most cases is sufficient to produce body and tobacco of strong texture. On the rather strong clay soils where the tobacco is inclined to grow too large and coarse, these conditions can be improved by transplanting closer in the field.

The bright smoker grades will not be so large as if grown on the lighter sandy loam soils, but for plug wrappers and fillers the heavier clay or clay loams are essential to produce the necessary body and texture for the latter grades.

The acreage for 1914 was a bit less than in 1913. The crop in general was rather late and did not look very promising during the early part of the growing season, but later, on account of more favourable conditions the greater portion of the crop developed into fair tobacco. There were a few very late crops that did not have time to mature properly, and these were cut late and quite green.

The crop in general cured out only fair. There was quite a bit of mouldy tobacco on the southwestern part of the island. However, there were some very good crops, and I am free to say that the best crop I saw in Ontario last year was grown on the island. I believe that the quality of tobacco on the island will be improved with proper drainage, for tobacco does not thrive on a waterlogged soil.

Norfolk County.—The culture of tobacco has recently been taken up by the Lynndale farm near Simcoe in this county. The result of the past year was only fair. The percentage of rather bright leaf was quite good but the crop in general was topped much too high and there were from two to four of the top leaves of the plants very small and inferior, besides the curing barns were very poor and some of the tobacco was injured by the winds and rains while curing.

I believe some of the soil around Simcoe would produce fairly good flue-cured tobacco. It is largely a fine sand and sandy loam which runs from a light yellow to a rather dark colour. The greatest trouble I believe would be to find a field that is very uniform, for all the various grades of sand are found in the same field. The contour of the land is rather broken, which no doubt accounts for the different kinds of soils. I believe that there are parts of Norfolk well adapted for Burley, quite a large territory southeast of Tilsonburg especially. The soil is principally a sandy loam, grading from yellow to very dark sand. The land is comparatively new and quite cheap. A good part of it is yet uncleared, but I think such land when cleared and put in good

tilth should produce a fine quality of Burley. It would probably take a couple of years to get the soil in proper shape on account of the timber and shrubbery that is now on the land. It should contain a rather large percentage of humus which I believe materially aids in the production of the best grades of Burley. This soil after being devoted to Burley and other farm crops for some time would probably be in good condition for growing "flue-cured" varieties of tobacco.

The Dominion Settlements Farm at St. Williams discontinued the growing of tobacco for 1914 on account of the unsatisfactory prices received for the 1913 crop. I think their greatest trouble was due to lack of experience in growing and handling the crop. The soil is very similar to that around Simcoe with the exception of probably a higher percentage of clay.

I believe that some experiments with flue-cured tobacco in the county would be of interest especially on the soils around Simcoe.

Lincoln County.—With the exception of the tobacco farm at Virgil there is no tobacco grown in this county. The greater portion of the land in Lincoln County suitable for tobacco is devoted to growing fruit, principally peaches and grapes. The farm at Virgil, which is producing cigar tobacco, is excellently equipped for the work, and should be able to produce some very good grades of cigar tobacco.

Welland County.—There is a little Burley tobacco produced at Fonthill and Welland in this county. The conditions here are quite similar to Lincoln County for the greater portion of land adapted to tobacco is devoted to fruit and truck farming.

Other sections.—There are other counties and localities in Ontario judging from soil and climatic conditions that should be fairly well adapted for growing both Burley and bright or flue-coloured tobacco: The southern portion of Ontario, Durham, Northumberland and Hastings.

ONTARIO.

EXPERIMENTAL PLOTS AT WALKERVILLE, ONT.

G. C. ROUTT, TOBACCO INSPECTOR.

The object of the experiment was to test some of the methods which have been recommended for controlling or checking the damage in the field caused by the fungus *Thielavia Basicola* or "Root Rot."

A strip of rather strong clay soil was selected on the tobacco farm of Walker Sons. The land had been devoted to tobacco for some time and was very badly diseased. The experiment consisted of 18 one-eighth of an acre plots or 2¼ acres in all. The plots were laid off in two parallel series of 9 plots each, the plots were 100 x 54½ feet and were separated by a space of 5 feet while a 10 foot space separated the two series. The first two plots, one in each series, were used for breeding and transplanting Burley at different distances and were not numbered. The remaining 16 plots were treated in the following manner. The materials used in treating the soil were acid phosphate and air slaked lime. The plots were numbered from 1 to 8 and their corresponding duplicates. The same amounts of material were to be applied both in the fall and spring, but for various reasons none of the materials were applied in the fall, so the two applications were made at different periods in the spring.

The following table gives the date and amounts of material applied to the plots.

1	125 lb. Acid Phosphate	May 4	Dup. 1	125 lb. Acid Phosphate	May 4
2	187½ " " "	" 4	" 2	187½ " " "	" 4
3	250 " " "	" 4	" 3	250 " " "	" 4
4	125 " " "	" 30	" 4	125 " " "	" 30
5	187½ " " "	" 30	" 5	187½ " " "	" 30
6	250 " " "	" 30	" 6	250 " " "	" 30
7	250 " Air Slacked Lime	" 30	7	80 " Air Slacked Lime	" 30
8	Check		" 8	Check.	

The material was sown broadcast on the plots and thoroughly worked into the soil with the disc harrow. The plots having been put in good condition before the applications were made.

The plots were redisced and thoroughly prepared for transplanting June 2. The transplanting was begun on June 3. The plots were set by hand 26 inches in the rows which were 3 feet 8 inches apart. The plants were watered when transplanted. All the acid phosphate plots were transplanted on this date but a heavy rain the night of June 3 prevented transplanting the remaining plots until June 6.

Plots No. 1 to 8 inclusive and their corresponding duplicates were transplanted to White Burley. The first two plots which were not numbered and untreated were to be used as breeding plots. Only one, however, was used for this purpose while the other was transplanted to White Burley at various distances in the row. Since every plot contained fifteen rows, 3 feet 8 inches apart, the plot devoted to Burley at various distances was divided into 5 sections with three rows in each. The three rows in each of the five sections were transplanted to Burley at 18, 20, 22, 24, and 28 inches in the row respectively. The breeding plot likewise was divided into five sections of three rows each which were transplanted to Canadian Comstock, Walkerville Comstock, Big Ohio, Improved Connecticut, Broadleaf and Improved White Burley. Since the plants were to be used for breeding purposes they were transplanted 30 inches in the rows which were 3 feet 8 inches apart.

All plants used were strong and healthy and started growing nicely soon after transplantation. A good stand was secured but the cutworms destroyed a few and the plots were re-set June 15.

The plots were cultivated and hoed June 23. The plants on all plots had started growing nicely and no difference could be detected between the plots at that time.

The plots were cultivated and hoed the second time July 3 and 4. While no particular difference could be noticed in the plots at this time there were a number of plants in all of them that were affected with the disease. This gave the plots a very irregular and spotted appearance.

On July 10 the following observations were made. Plots 1, 2, 3, and 4, also duplicates, contained a number of sick plants but the plants were larger and more uniform in growth than on plots 5, 6, 7, and 8, also duplicates, where the number of infected or diseased plants was much greater and, no doubt, accounted for their being smaller and the general appearance of the plots being more spotted. The plants on plots 7 and 8 and duplicates were a bit smaller on an average than the plants on plots 5 and 6; this was probably due to their being transplanted three days later.

The varieties on the breeding plot were growing well and seemed to be very little affected or diseased with the exception of the three rows of improved White Burley which were badly diseased. The plot that was transplanted to Burley at different distances was also badly diseased and the plants were making very slow growth.

All plots were again cultivated on July 20th and hoed on the 21st. The condition of the plots at the time was very much the same as on July 10. The plants that were badly diseased had made practically no growth while the plants that were only slightly or not infected at all were growing fairly well. The duplicate plots seemed to be better than the rest; this was probably due to the difference in the soil which was more of a sandy nature which would tend to check the disease. It is also possible that there were spots that were not diseased at all and on these the plants developed normally.

The tobacco on plots 1, 2, 3, 4, and 5, also duplicates, were topped on August 4. The tobacco on the plot where Burley was transplanted at different distances was also topped. While the tobacco on 6, 7, and 8, was rather small and topping was postponed until a later date.

On August 4th and 7th reciprocal crosses were made with White Burley on Canadian Comstock, Walkerville Comstock, Big Ohio and Improved Connecticut Broad Leaf with a fair degree of success. The remaining plots 6, 7, and 8, also duplicates, were topped on August 14.

The growth of the plants on all the plots was very slow, especially those diseased, which in many cases were too small to top.

The tobacco on plots 1, 2, 3, and 4, also duplicates and plot with Burley at different distances were cut and housed on September 4th and 5th. The plants on duplicate plots were split in harvesting while those on the other plots were unsplit and speared in the usual way. The remaining plots, 5, 6, 7, and 8, also duplicates, were cut and housed September 18th and 19th.

The tobacco cured out in very good order and the colour was fair even with the very small plants, some of which were unusually small.

The tobacco was bulked down in small piles, each plot being kept separate, November 16 and stripped, tied into hands and weighed November 17th and 18th. It was put into three grades: trash, long red, and short red or tips.

The following table gives the weights of the respective grades also total weight and percentage of stand on each plot.

No. Plot.	Trash.	Long Red.	Short Red. (Tips)	Total Wt.	Percentage of stand.
	Lb.	Lb.	Lb.	Lb.	p. c.
1	32	52	21	105	74
Dup. 1	27½	61½	26½	115½	83
2	30	50	27	107	85
Dup. 2	31	67	22	120	87
3	21	28	36½	85½	71
Dup. 3	23	46	23½	92½	81
4	28	54	21	103	87
Dup. 4	33	56	23	112	91
5	22	34	17	73	69
Dup. 5	25	31	21	77	74
6	21	29	16	66	65
Dup. 6	23	30	18	71	69
7	20	27	15	62	70
Dup. 7	23	28½	17½	69	73
8	22	26	17	65	72
Dup. 8	24	28½	18	70½	81
Total	405½	648½	340	1,394	
Average	25⅓ lbs.	40½ lbs.	21¼ lbs.	87½ lbs.	77

Burley at different distances:—

18 inches in the row	8½ lb.	9 lb.	4 lb.	21½ lb.
20 " "	8½ "	8½ "	3½ "	20½ "
22 " "	8½ "	7 "	5 "	20½ "
24 " "	7½ "	10 "	2½ "	20 "
28 " "	9½ "	13 "	3 "	25½ "
				108 lb.

From the above table it can be readily seen that the duplicate plots gave a bit better yield than the other plots, this no doubt was due to the physical characteristics of the soil which contained more sand and had a tendency to check the disease on these plots.

The reduction in yield on plot 3 and the corresponding duplicate was probably due to a ditch which had been dug the year previous to lay a pipe line. A large amount of the clay subsoil was thus brought to the surface and the soil on these plots was very hard to put in proper tilth or cultivation. Plots 1, 2 and 3, also duplicates, which received the treatment of acid phosphate about 28 days before plots 4, 5 and 6, also duplicates, gave a somewhat better yield than the latter plots. This might be a point in favour of the earlier application but could also be due to the soil on the former plots being a little stronger. The remaining plots gave about the same yield. In fact, very little difference could be detected between the last two plots treated with acid phosphate, the limed and check plots.

The percentage of stand on the plots was rather low because so many of the diseased plants did not grow and mature to sufficient size for housing and were left on the plots.

As a general summary of the experiments I do not think it shows any conclusive evidence in favour of the acid phosphate as a means of controlling the disease.

WALKERVILLE.

As to the tobacco on the plot transplanted to Burley at different distances no difference could be detected in the colour and quality of the tobacco although the 3 rows which were transplanted at 28 inches gave a few pounds larger yield.

The tobacco on the breeding plot was not harvested with the rest of the plots but the plants that were not used for seed purposes were turned over to the manager of the tobacco farm.

The following crosses were made on the breeding plot with a fair degree of success:—

405. Comstock Walkerville x White Burley.
406. Comstock Canadian x White Burley.
407. Comstock Canadian x White Burley.
408. Comstock Canadian x White Burley.
410. Imp. Connecticut Broad Leaf x White Burley.
411. Imp. Connecticut Broad Leaf x White Burley.
412. Big Ohio x White Burley.
413. Big Ohio x White Burley.
414. Big Ohio x White Burley.
415. Imp. Connecticut Broad Leaf x Imp. White Burley.
416. Big Ohio x Imp. White Burley.
417. White Burley x Imp. Connecticut Broad Leaf.
418. White Burley x Big Ohio.
419. White Burley x Comstock Canadian.
420. White Burley x Comstock Walkerville
421. White Burley x Comstock Walkerville.

SELECTION WORK AT HARROW.

The results of the selection work at Harrow were not very favourable because the plots were located in an orchard where the characteristic developments of the different varieties were materially checked. However some fair seed plants were procured of the following varieties:—

202. Virginia x Erzegovine x Virginia (55).
203. Erzegovine x Stolak (54).
204. Stolak (12).
205. Erzegovine x Stolak (54).
206. Stolak (7).
207. Virginia x Erzegovine x Virginia (52).
208. Stolak (7).
209. Virginia x Erzegovine (42).
210. Virginia x Erzegovine (39).
211. Virginia x Erzegovine (35).
212. Virginia x Erzegovine x Virginia (55).
213. Virginia x Erzegovine x Virginia (35).
215. Stolak (12).
216. Stolak (7).

The following crosses were also made at Harrow:—

422. White Burley x Warne.
423. White Burley x Warne.
424. White Burley x Gold Leaf.
425. Warne x White Burley.

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